

OKI MICROLINE 294

MAINTENANCE MANUAL

PREFACE

This maintenance manual has been prepared for maintenance work on the Microline 294 printer.

The maintenance procedures have been described for use by qualified maintenance personnel.

Refer to the Users Manual for details on printer operating procedures.

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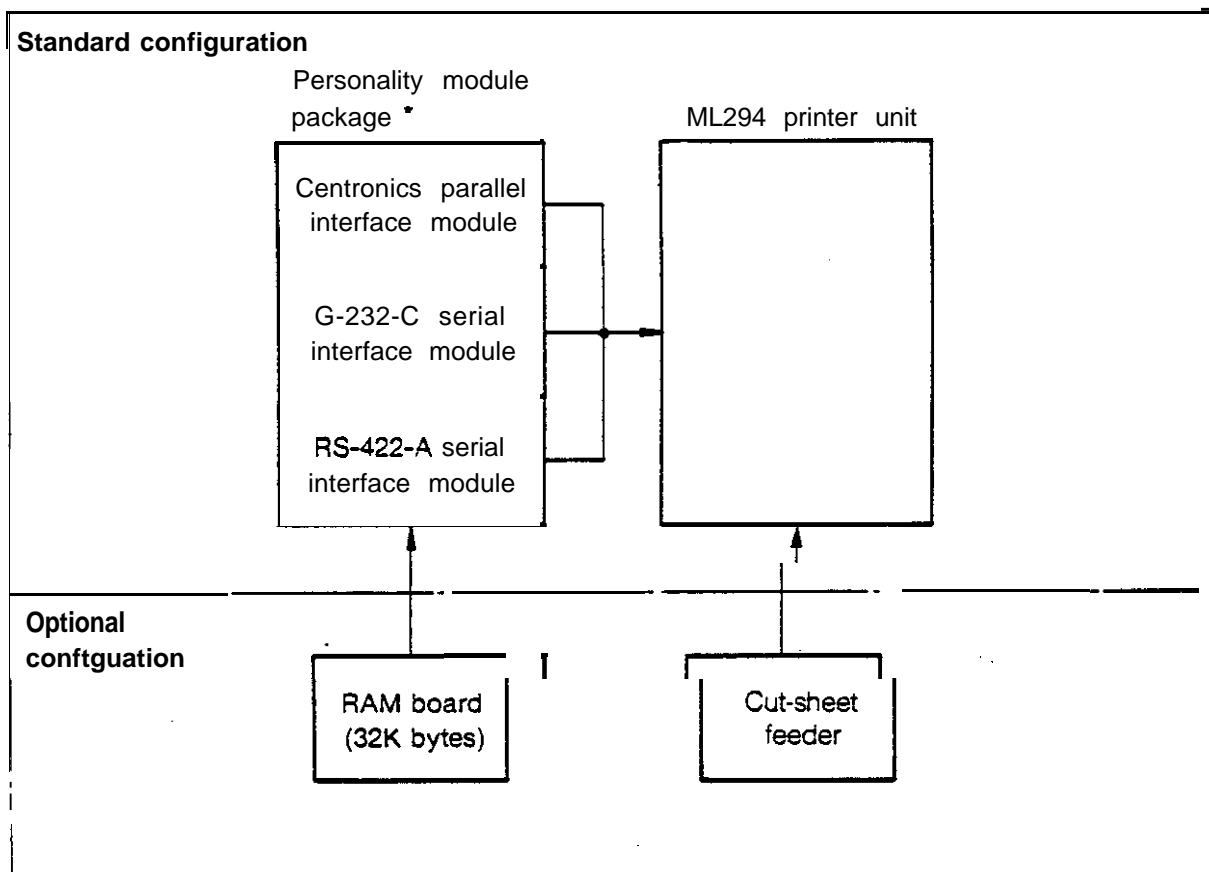
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1. CONFIGURATION

1.1 System Configuration

The standard Microline 294 configuration includes a printer unit and an personality module package (see Figure I-1). An extensive range of options is also available for these printers.



* Only one module can be installed at one time.

Figure I-1 Microline 294 configuration

1.2 Printer Configuration

The major component parts of the ML294 printer are outlined below.

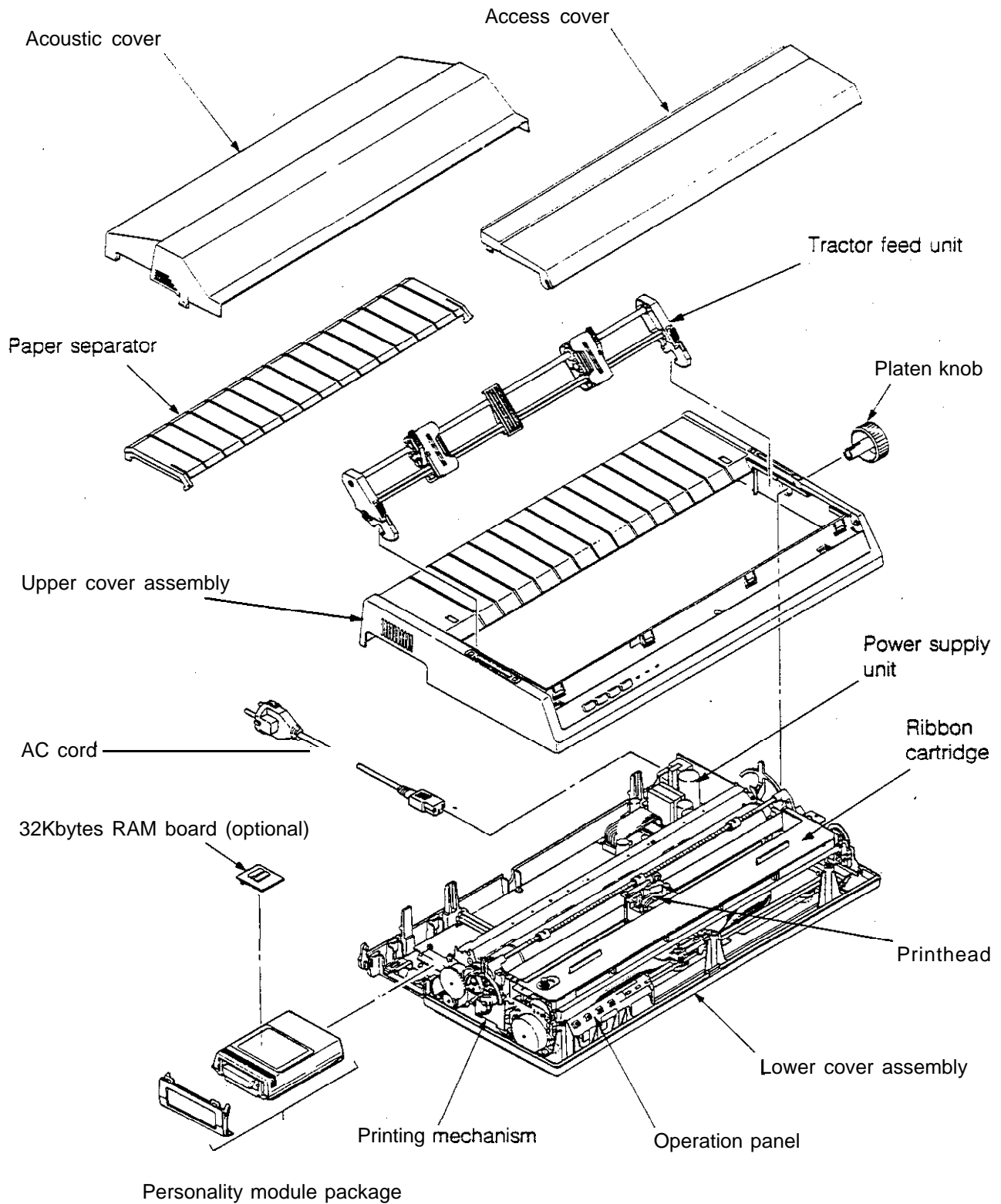
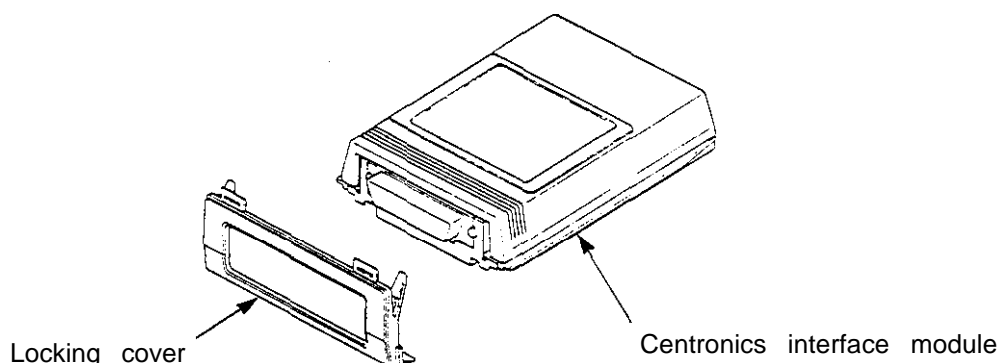


Figure I-2 Printer configuration

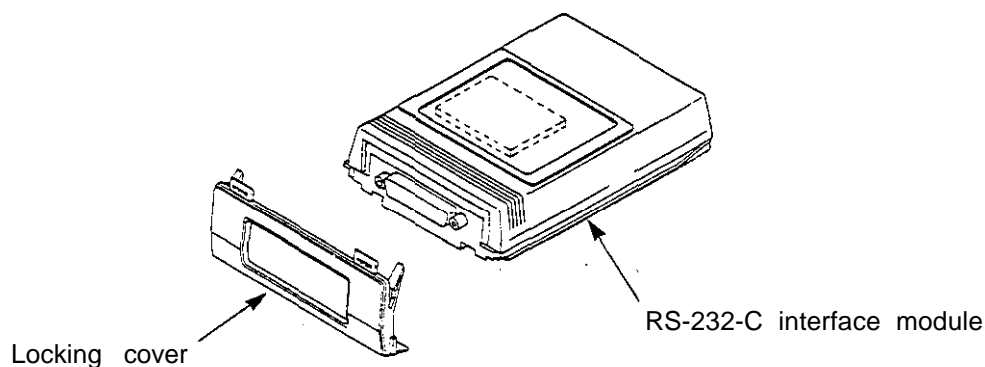
1.3 Personality Module Package Configuration

The personality module package consists of an interface module and a locking cover. Different types may be selected for mounting in the printer.

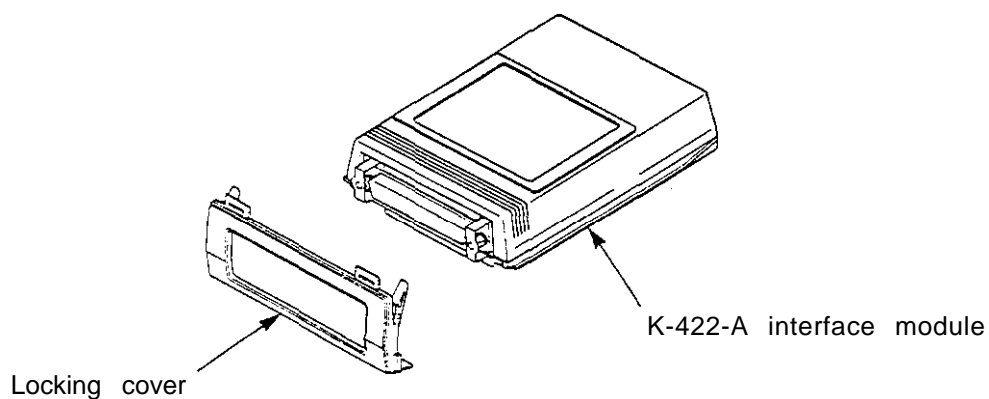
- (1) Personality module package with Centronics type parallel interface
Connector: 36-contact (Amphenol or equivalent)



- (2) Personality module package with RS-232-C serial interface
Connector: 25-pin female (Canon DB25 or equivalent)



- (3) Personality module package with RS-422-A serial interface
Connector: 37-pin female (Canon DB37 or equivalent)


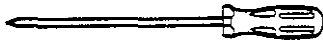








2. MAINTENANCE TOOLS

2 MAINTENANCE TOOLS

The maintenance tools required for on-site printed circuit board and unit parts replacement operations are listed in Table 2-1.

Table 2-1 Maintenance tools

No.	Maintenance tool	Q'ty	Usage	Remarks
1	 No.1-100 Phillips screwdriver	1	2.6 mm screws	
2	 No.2-200 Phillips screwdriver		3 mm screws	
3	 No.3-100 screwdriver			
4	 5.5 mm wrench	1		
5	 7 mm wrench			
6	 Volt/ohm meter			
	 Feeler gauge	1	Head gap adjustment	0.4 mm. 0.45 mm and 0.5 mm gages are necessary
8	 Pliers	1		

3. REPLACEMENT OF PARTS

3. REPLACEMENT OF PARTS

3.1 Precautions When Replacing Parts

- (1) Always ensure that the AC POWER switch is off and that the XC power plug has been disconnected before disassembly and re-assembly of the printer.
- (2) As long as the printer is functioning normally, refrain from disassembling the printer,
- (3) Do not remove parts unless really necessary, and keep disassembly operations to a bare minimum.
- (4) Use only specified maintenance tools.
- (5) When disassembly becomes necessary, proceed according to the given sequence. Failure to follow the proper sequence can result in damage to component parts.
- (6) Leave screws, collars, and other small parts temporarily in their original positions to avoid misplacement and loss.
- (7) Do not use gloves which can easily generate static electricity when handling microprocessors, ROMs, RAMs, other IC components and circuit boards.
- (8) Do not place printed circuit boards directly on top of the equipment or on the floor.

3.2 Parts Replacement Method

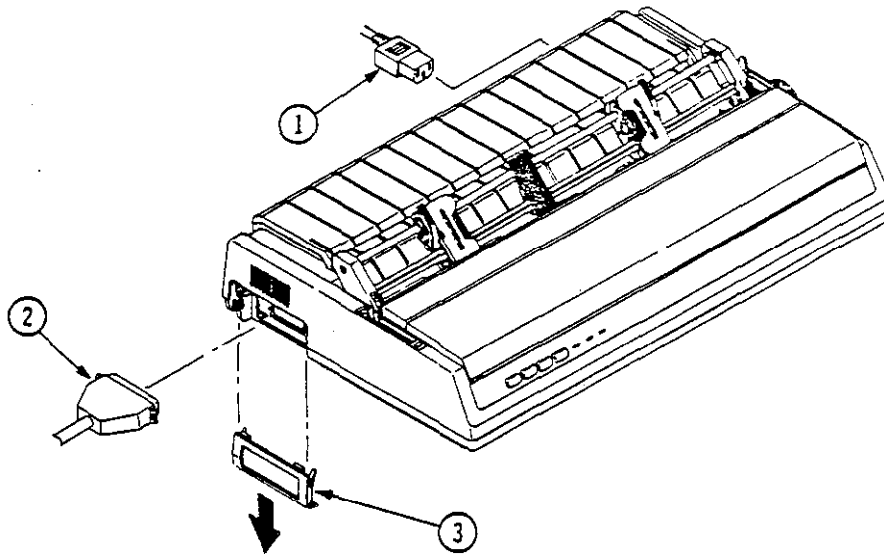
The replacement method of the assemblies according to the following system diagram will be described.

- 3.21 Personality module package
- 3.22 Upper cover
- 3.23 Main control board
- 3.24 Power supply unit
- 3.25 Operation board
- 3.26 Print head
- 3.27 Ribbon protector
- 3.28 Space motor assembly
- 3.29 Space rack
- 3.210 Ribbon drive assembly
- 3.211 Carriage cable
- 3.212 Printing mechanism
- 3.213 LF motor assembly
- 3.214 Column indicator assembly
- 3.215 Connection board
- 3.216 Platen assembly
- 3.217 Paper chute assembly

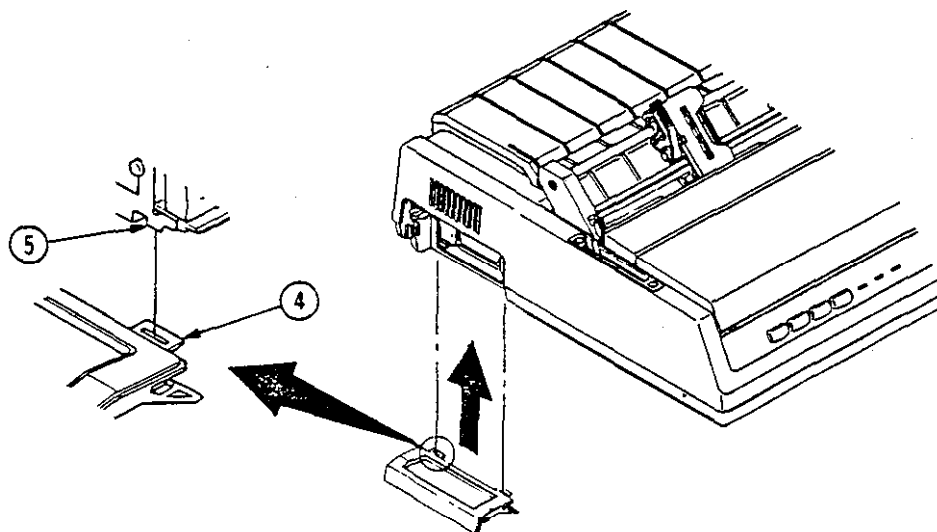
3.2.1 Removing and remounting the personality module package

(A) Removing

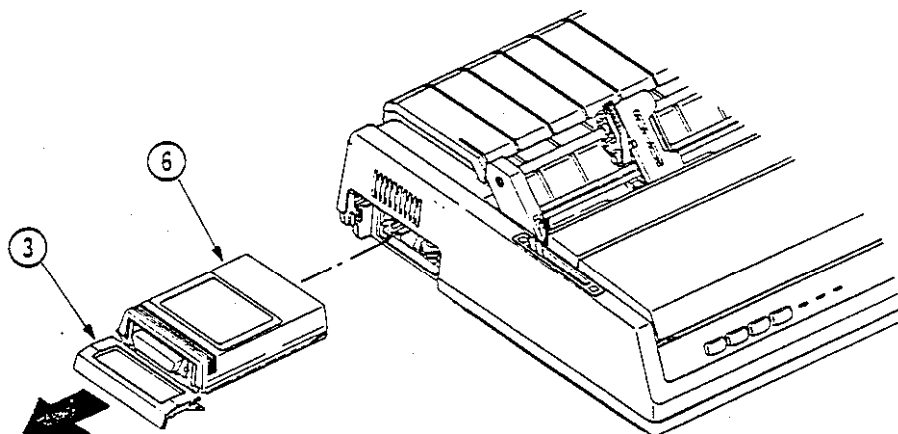
- (1) Turn the POWER switch off and disconnect the AC cord ① from the inlet.
- (2) Disconnect the interface cable ②.
- (3) Pull down the locking cover ③ of the personality module package.



- (4) Engage the locking cover catch holes ④ with tabs ⑤ of the interface module.



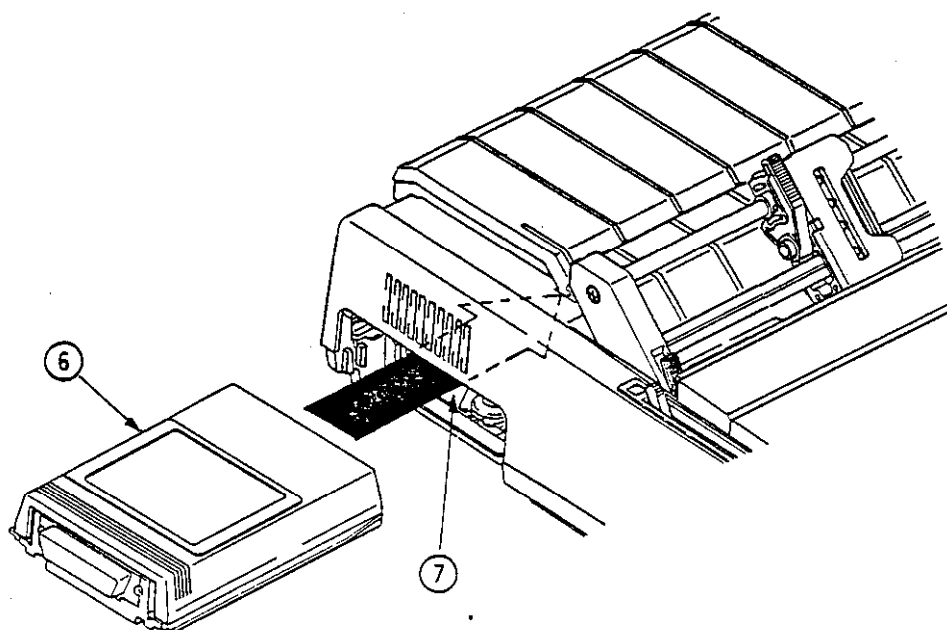
- (5) Extract the interface module (6) by pulling the locking cover (3) out.



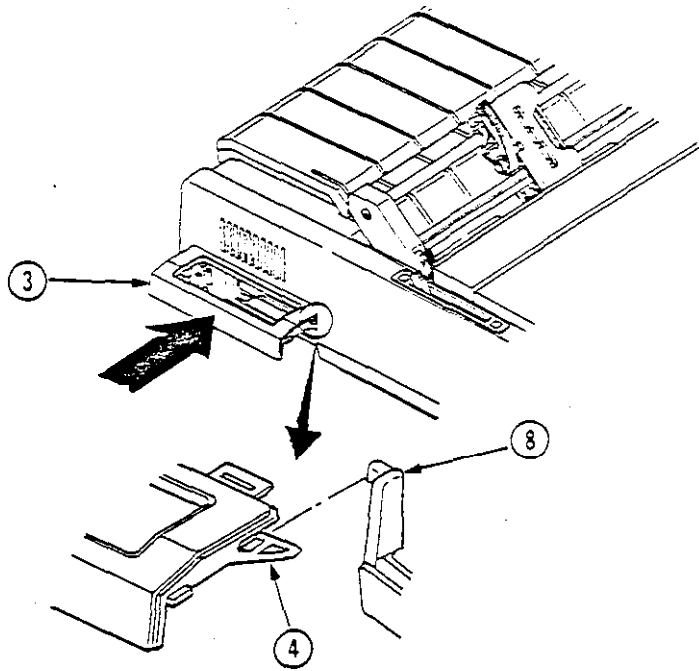
(B) Remounting

Note: When remounting the interface module, align with the guides and push in **without applying** undue force.

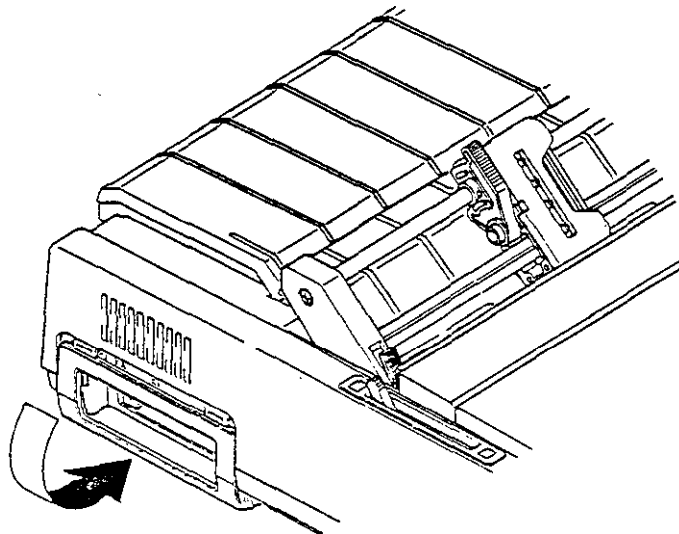
- (1) Remount the interface module (6) along the insertion guide (7) of the printer.



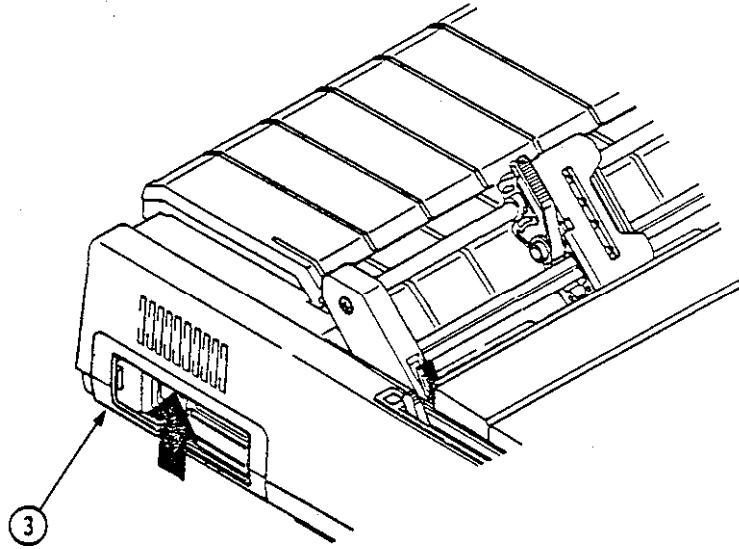
- (2) Insert the tabs ④ of the locking cover ③ to inlet by pushing them to the post ⑧ of the lower cover.




- (3) Turn the locking cover ③ down by making the post ⑧ a fulcrum and fit it to the lower cover inlet.



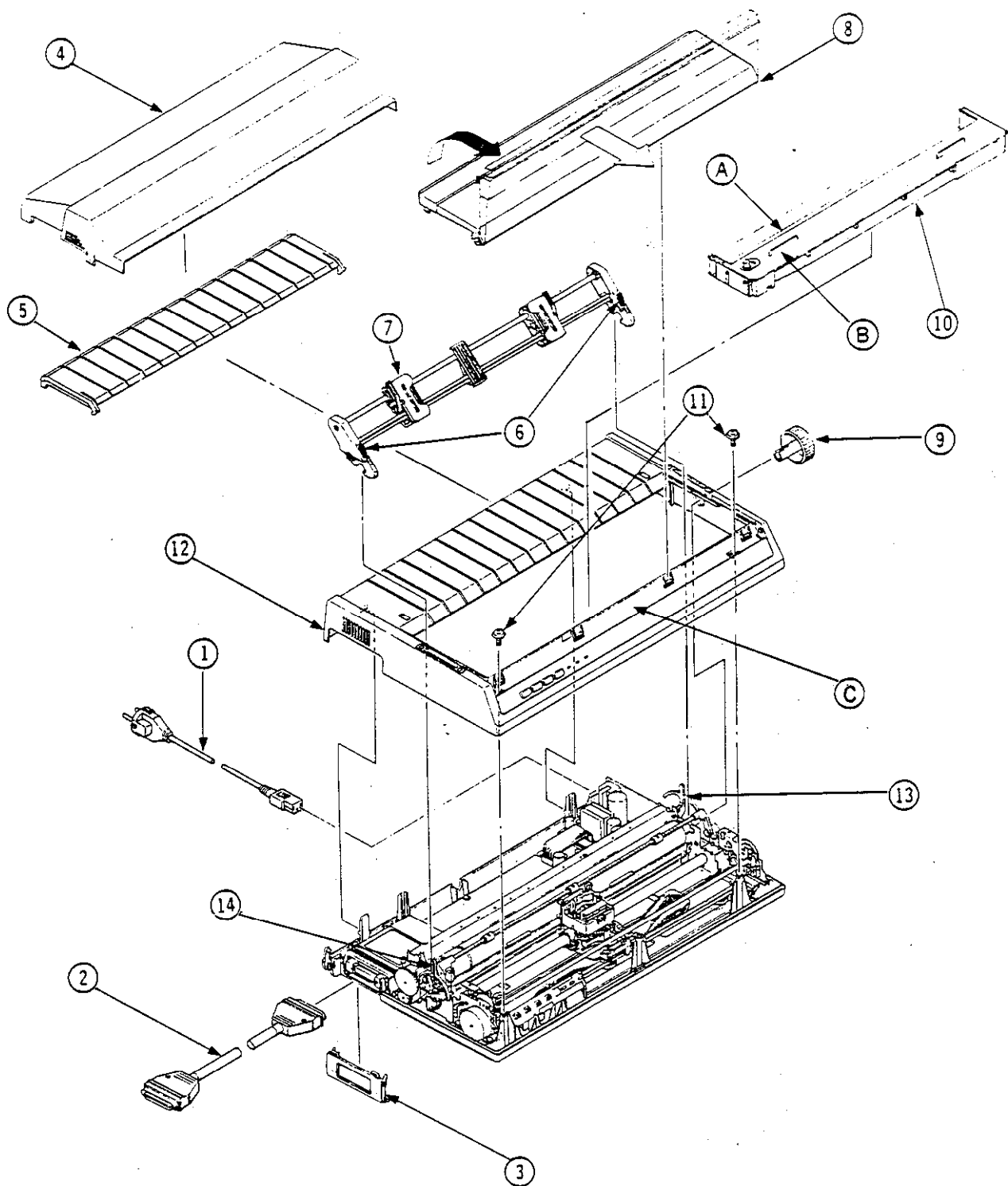
- (4) Push up the locking cover ③ and snapped fasten it securely



3.2.2 Upper Cover

- (1) Turn the power switch off and disconnect the AC cord ① from the inlet.
- (2) Disconnect the interface cable ②.
- (3) Remove the locking cover ③ of the personality module package.
- (4) Remove the paper.
- (5) Remove the acoustic cover and paper separator ⑤.
- (6) Press the lock lever ⑥ down, and remove the tractor feed unit ⑦ while inclined towards the rear.
- (7) Remove the access cover ⑧ by pulling the rear end up as indicated in the diagram.
- (8) Remove the platen knob ⑨.
- (9) Remove the ribbon cartridge ⑩ by gripping firmly its (A) and (B) portions of its both sides.
- (10) Undo two screws ⑪, and release the lock tab of the upper cover ⑫ by just pushing  backward.
- (11) Raise the front of the upper cover ⑫ and remove towards the rear.
- (12) Remount in the reverse sequence from the removal procedure.

Note: Take note of the release lever ⑬ and paper bail lever ⑭ positions when remounting.



3.2.3 Main Control Board

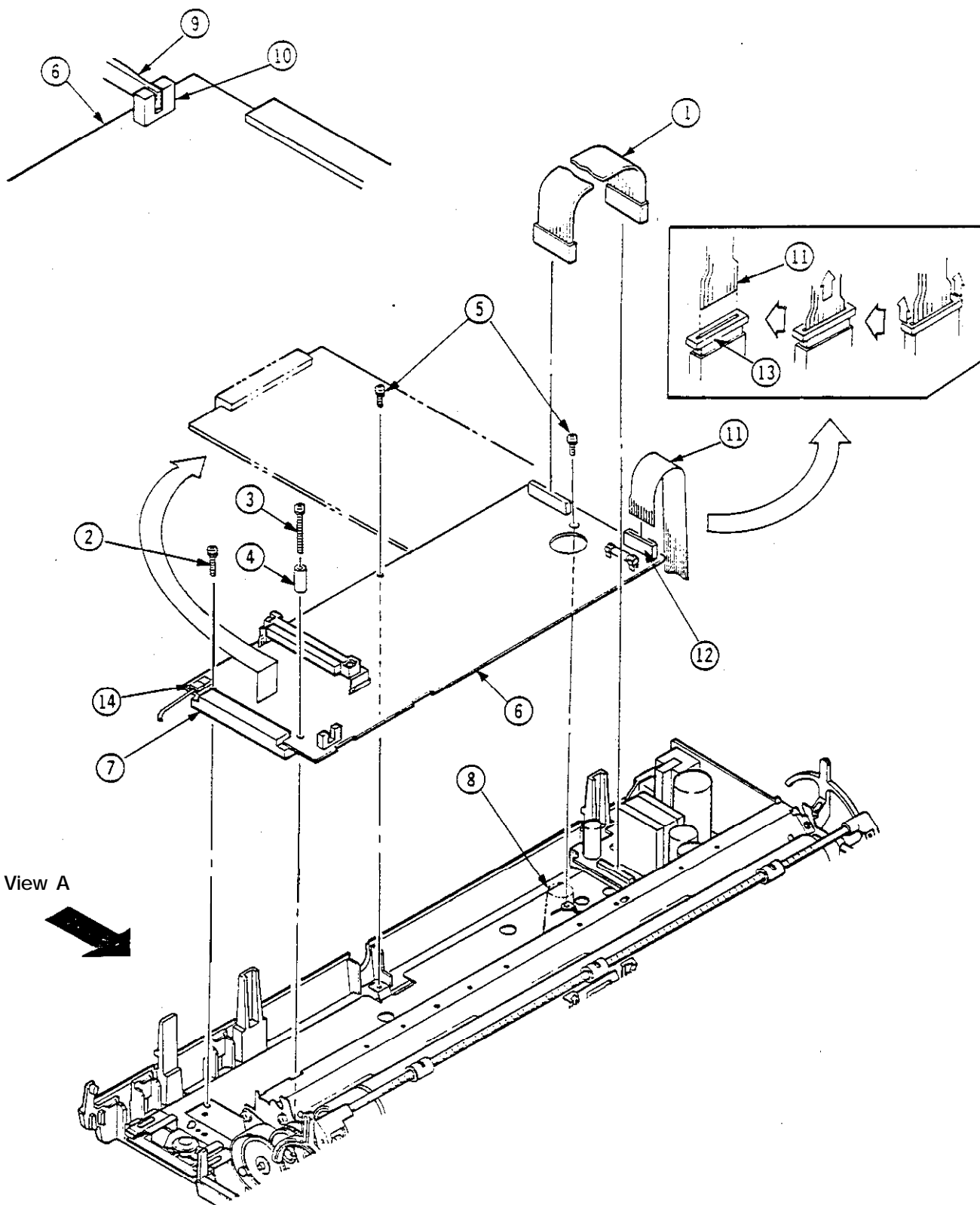
- (1) Remove the personality module package (see item 3.2.1)
- (2) Remove the upper cover (see in item 3.2.2)
- (3) Disconnect the power cable ① and SASF connection cable ⑭ from the main control board.
- (4) Disconnect the base cable ⑪ from base cable connector ⑫ after releasing the cable fastener ⑬ by lifting it up.
- (5) Remove the screws ②, ③ on both side of the connector ⑦ and the collar ④.
(Take care of the collar loss).
- (6) Undo the two screws ⑤.
- (7) Pull up the connector and the reverse sides of the main control board ⑥, and turn the main control board about 90 deg. clockwise with respect to post ⑧. Then remove the main control board ⑥.

Note: Take note of the paper near end lever ⑨ left engaged with the photo sensor ⑩, when removing the main control board ⑥.

- (8) Remount in the reverse sequence from the removal procedure.

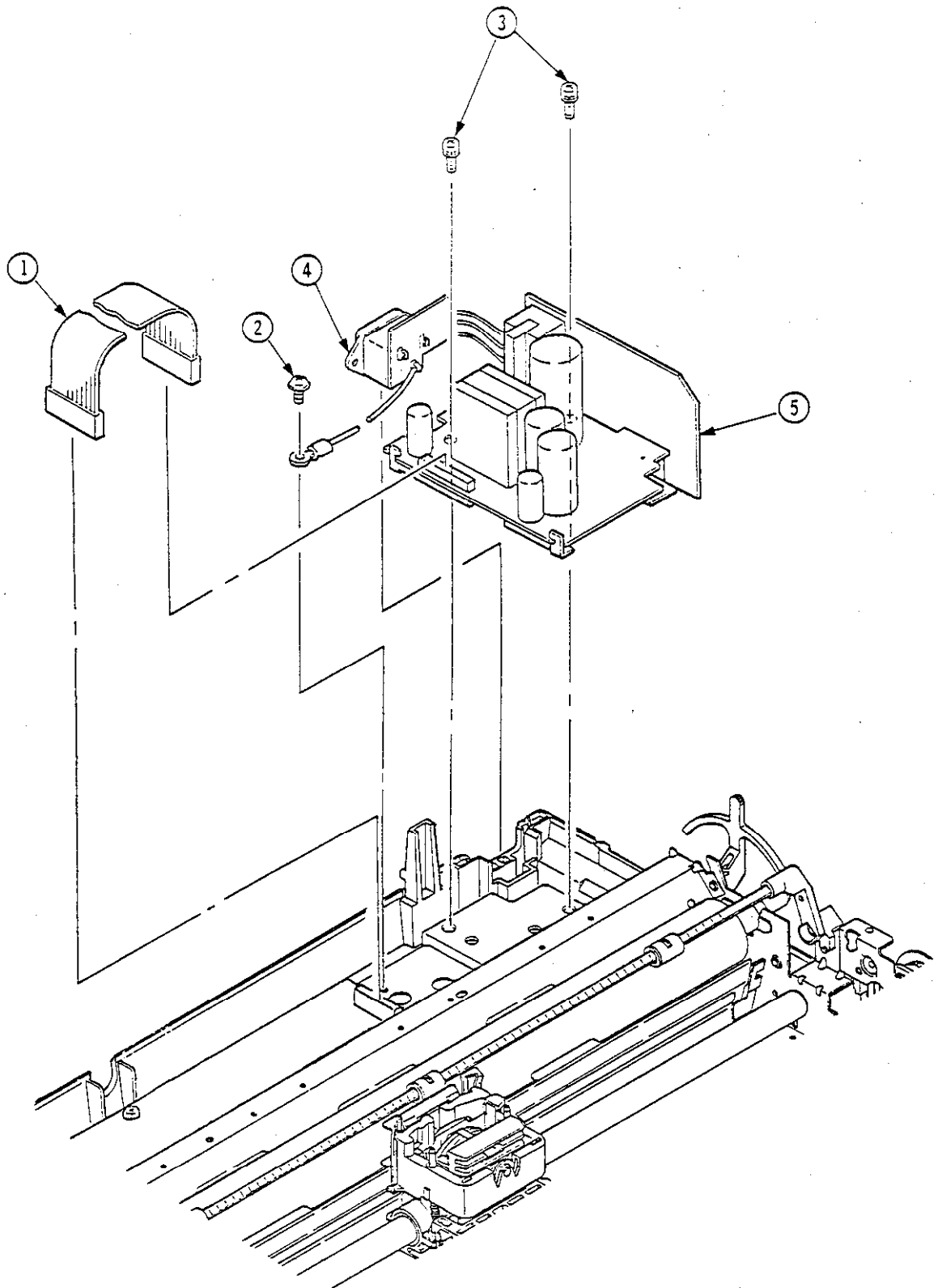
Note:

1. To prevent loose connections, do not touch the uncovered (crimped) pins of the connector ⑦. Also prevent the accumulation of dust on these pins.
2. When remounting the main control board ⑥, check that the paper near end lever ⑨ is positioned in the groove of photosensor ⑩ on the board.



3.2.4 Power Supply Unit

- (1) Remove the upper cover [see item 3.2.2).
- (2) Disconnect the power cable connector ① from the main control board.
- (3) Undo the screws ② fastening the ground terminal.
- (4) Undo the two screws ③ fastening the power supply assembly.
- (5) Lift power supply assembly ⑤ and the AC cord inlet ④ out together.
- (6) Remount in the *reverse sequence* from the removal procedure.

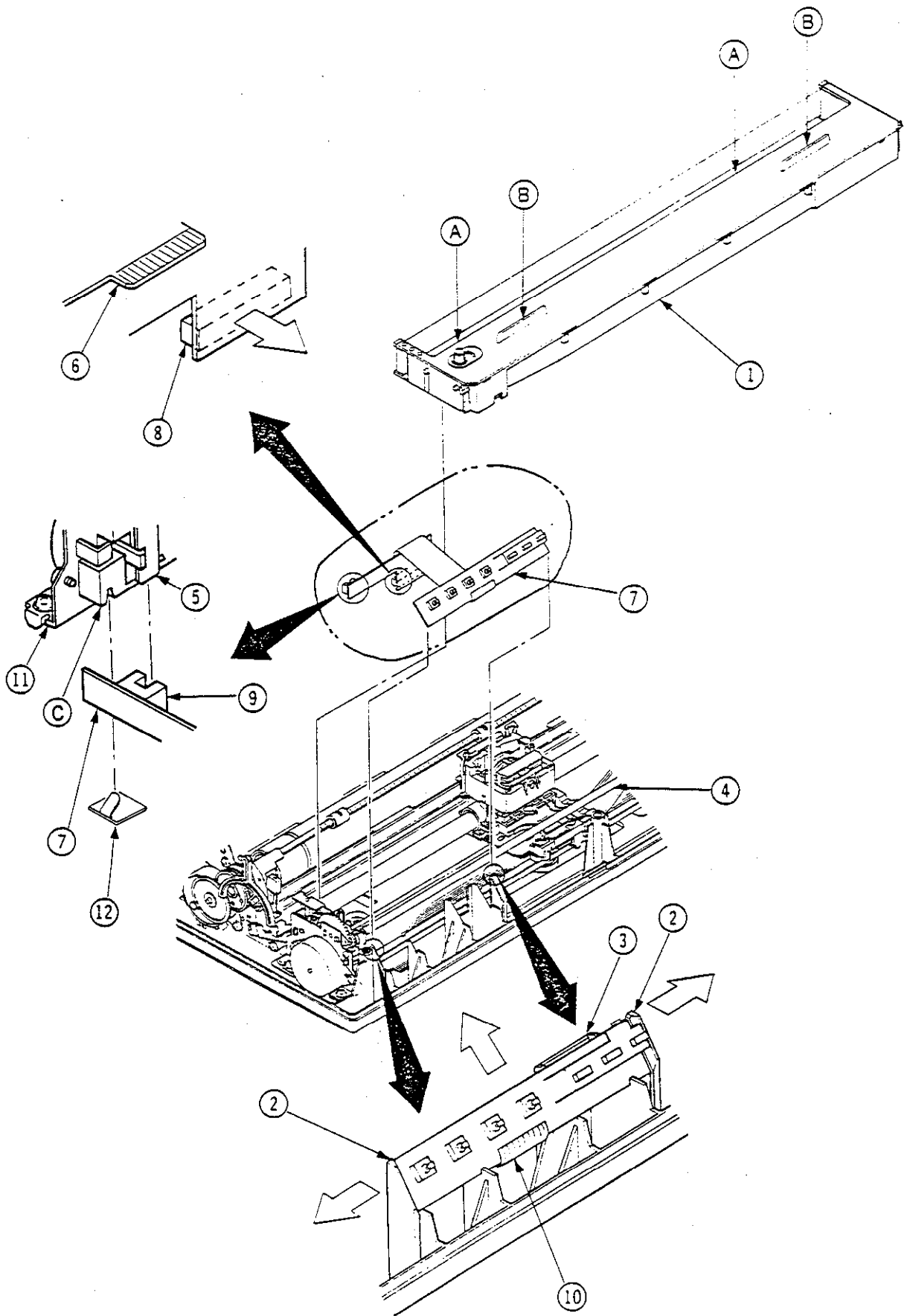


3.2.5 Operation Board

- (1) Remove the upper cover (see item 3.2.2)
- (2) Move the print head to the center, and grasp portions (A) and grips (B) firmly and lift up the ribbon cartridge (1) out.
- (3) Disengage the two tabs (2), and remove operation board (3) by sliding it upwards.
- (4) Turn the shaft (4) by hand until the shift bracket (5) is at the highest position.
- (5) Grasp connector (8) of operation board (3) connected to the connection board (6) and pull out forwards.
- (6) Remove operation boards (3).
- (7) Remount in the reverse sequence from the removal procedure.

Notes:

1. Handle the cable (10) connecting the connector section to the switch section carefully.
2. When remounting, check that the edge of operation board (3) is in groove (C) of the ribbon drive assembly (L) (11) with care of the spring (12).
3. Check that the shift bracket (5) of the ribbon drive assembly (L) passes through the ribbon shift home position sensor (9).



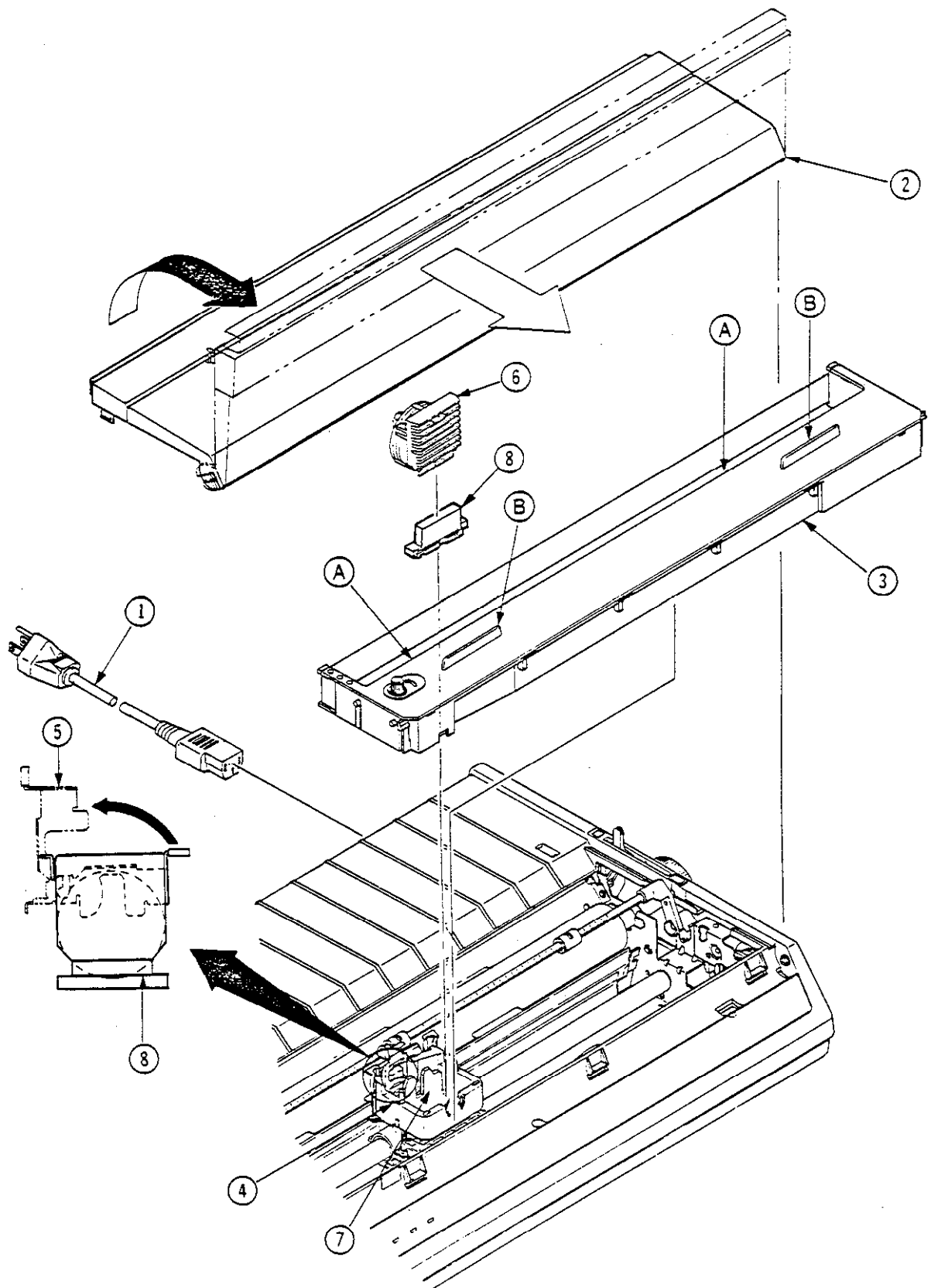
3.2.6 Printhead

- (1) Turn the POWER switch off and disconnect the AC cord ① from the inlet.

Note: The printhead is still hot immediately after completing printing. Wait for the head to cool down before removing.

- (2) Remove the access cover ② by pulling the rear end up.
- (3) Shift the printhead to the center.
- (4) Take a firm hold of portions ④ and grips ⑤ of the ribbon cartridge ③ and lift up and out.
- (5) Press the front ribbon guide ④ down, and then raise head clamp ⑤ while pressing towards the platen and turning counter clockwise. The printhead ⑥ can then be removed by lifting straight up and out.
- (6) Remount in the reverse sequence from the removal procedure.

Note: When remounting, press the printhead ⑥ against the carriage frame ⑦ and plug it into the connector ⑧.



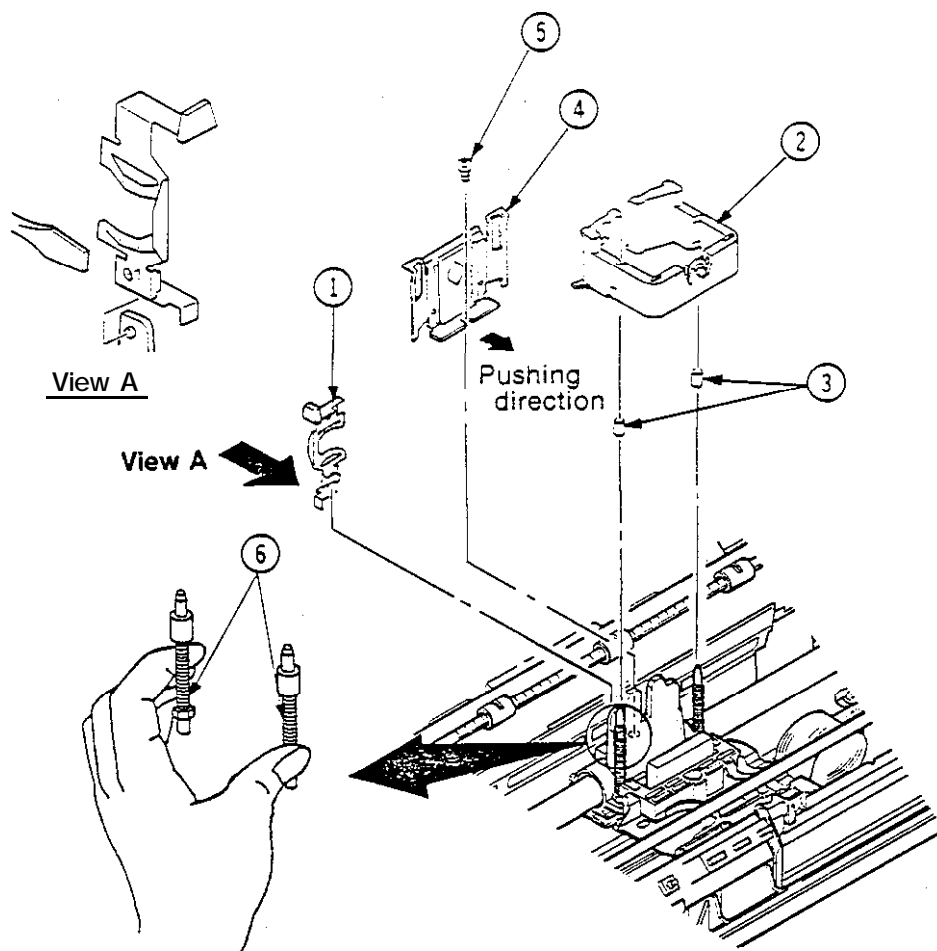
3.2.7 Ribbon Protector

- (1) Remove the upper cover (see item 3.2.2).
- (2) Remove the ribbon cartridge.
- (3) Remove the printhead (see item 3.2.6).
- (4) Disconnect the joint and remove head clamp ①. By pressing the bias spring @then lift and remove the front ribbon guide ② together with two collars@.

Note: Do *not* lose the collars.

- (5) Undo the screw ⑤ fastening the ribbon protector ④, and remove the protector by lifting up.
- (6) Remount in the reverse sequence from the removal procedure.

Note: When remounting, *push the ribbon protector to touch the front side of the carriage frame.*

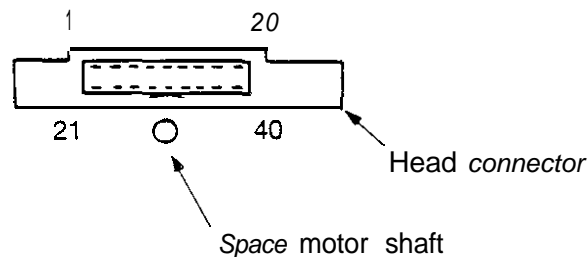


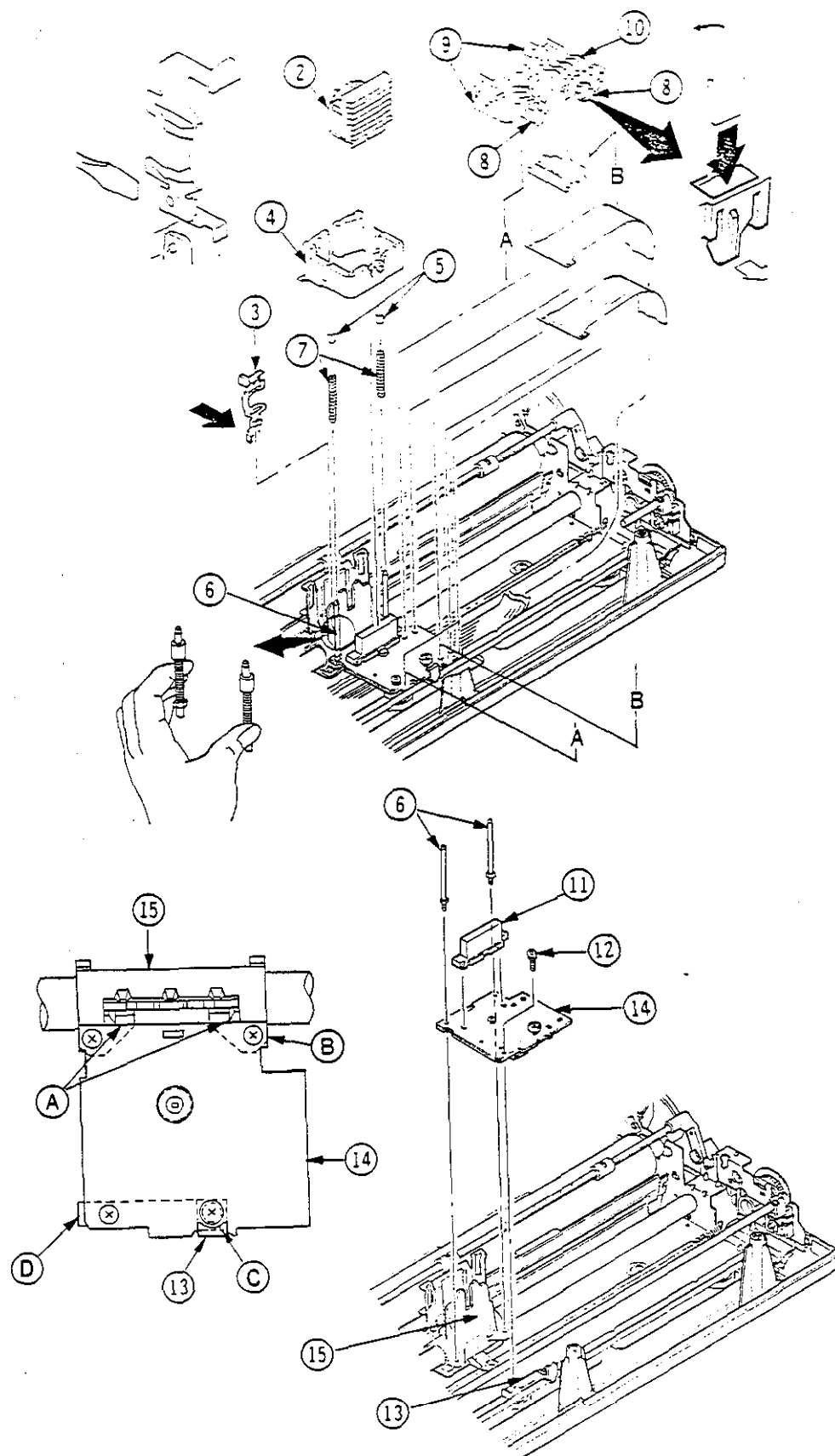
3.28 Space Motor Assembly

- (1) Remove the upper cover (see item 3.2.2)
- (2) Remove the ribbon cartridge.
- (3) Remove the print head ② (see item 3.2.6)
- (4) Forcibly disconnect the joint of the head clamp ③, pressing the joint toward the platen with a screwdriver, and remove the head. clamp ③.
- (5) Lift and remove the front ribbon guide ④ by pressing the bias spring ⑦ and remove the two collars ⑤. (Take care of the collars loss)
- (6) Lift the two biased springs ⑦ to remove them from the two ribbon guide studs ⑥.
- (7) Disengage the front three tabs ⑧ and rear two tabs ⑨ of the carriage cover by inserting a screwdriver into the respective grooves and remove the carriage cover ⑩.
- (8) Disconnect connector ⑪.
- (9) Remove the two ribbon guide studs ⑥ using the 5.5 mm wrench.
- (10) Undo screw ⑫, shift slider ⑬ forward, and then lift the space motor assembly ⑭ out.
- (11) Remount in the reverse sequence from the removal procedure.

Notes:

1. To **prevent** loose connections, do not touch or bend the uncovered (crimped) pins of the space motor assembly ⑭, and do not permit dust to accumulate on these pins.
2. Push the space motor assembly ⑭ to A of the carriage frame ⑮, and mount after aligning the space motor assembly to the carriage frame edge B.
3. Mount slider ⑬ on the space motor assembly ⑭ touching section C of the slider to the space motor assembly.
4. After remounting the space motor assembly, check the gap between the platen and printhead, and adjust (see Section 5).
5. When remounting the head connector ⑪, turn its central semicircular section to the front side.



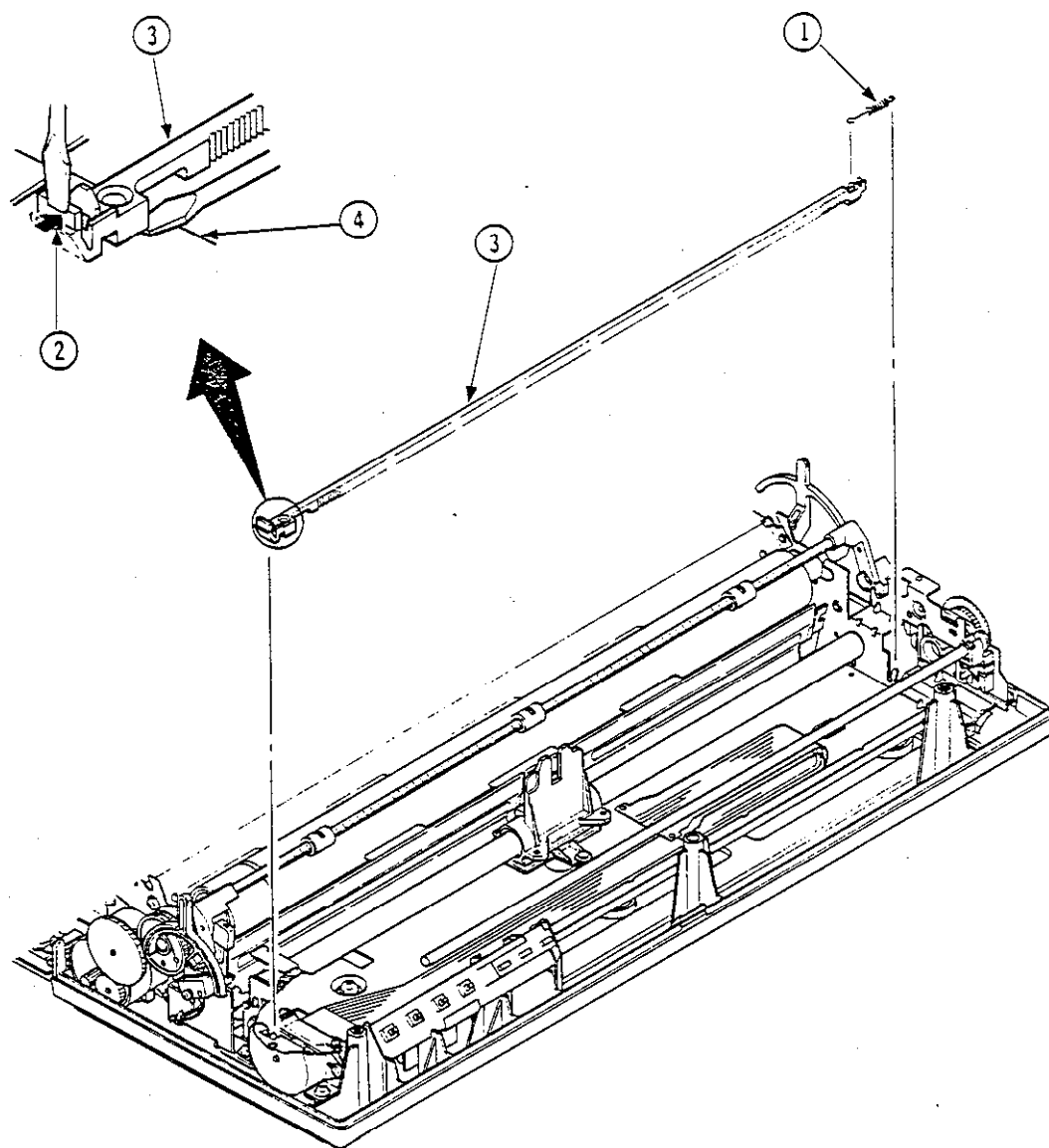


3.29 Space Rack

- (1) Remove the upper cover (see item 3.2.2).
- (2) Remove the ribbon cartridge.
- (3) Remove the printer head (see item 3.2.6).
- (4) Remove the space motor assembly (see item 3.2.8).
- (5) Remove spring ①.
- (6) Remove the tab ② with a slotted screwdriver, insert another slotted screwdriver between the space rack ③ and the base frame ④, and gently raise the space rack out.
- (7) Remount in the reverse sequence from the removal procedure.

Notes:

1. *After remounting the space motor assembly, check the gap between the platen and print-head, and adjust the gap (see Section 5).*
2. *When a **new space** rack is mounted, make sure it is lubricated as described in Section 6 (5) (b).*

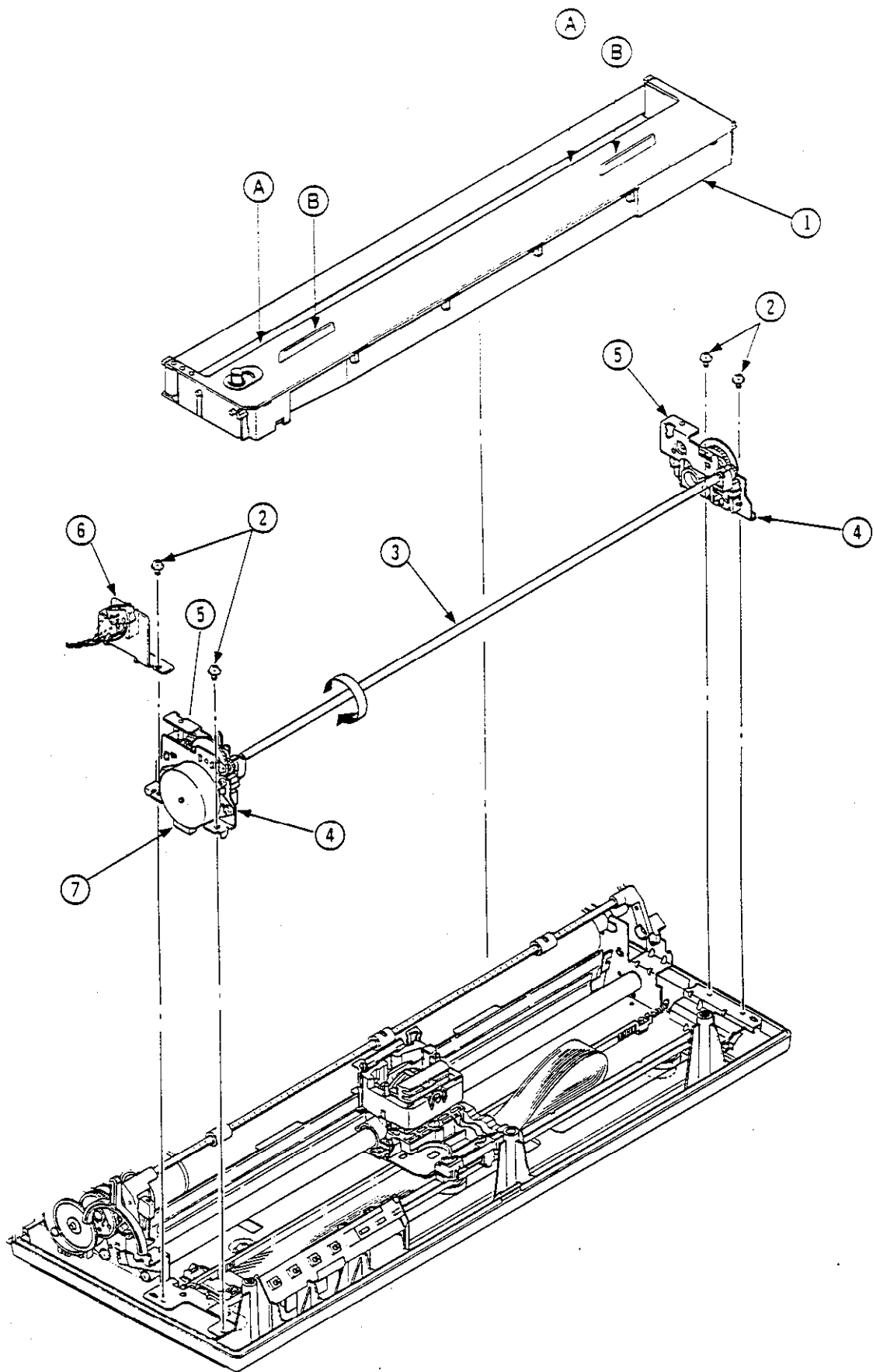


3.2.10 Ribbon Drive Assembly

- (1) Remove the upper cover (see item 3.2.2).
- (2) Take a firm hold of portions **(A)** and grips **(B)** of the ribbon cartridge **(1)** and lift up and out.
- (3) Manually turn the ribbon drive shaft @to lift the shift bracket **(5)** up to the uppermost.
- (4) Undo the four screws **(2)** and lift the semi-autoautomatic sheet feed assembly **(6)** and ribbon drive assembly **(4)** to remove them.

Notes:

1. *To prevent loose connections, do not touch or bend the uncovered (crimped) pins **(7)** of the ribbon motor assembly@, and do not permit dust to accumulate on these pins.*
2. *Do not twist the ribbon drive assembly. When twisted, restore it in the former state.*
3. *When replaced the ribbon drive assembly, adjust the ribbon moter mounting position and the ribbon height according to section 5 item 5.3 and 5.4.*

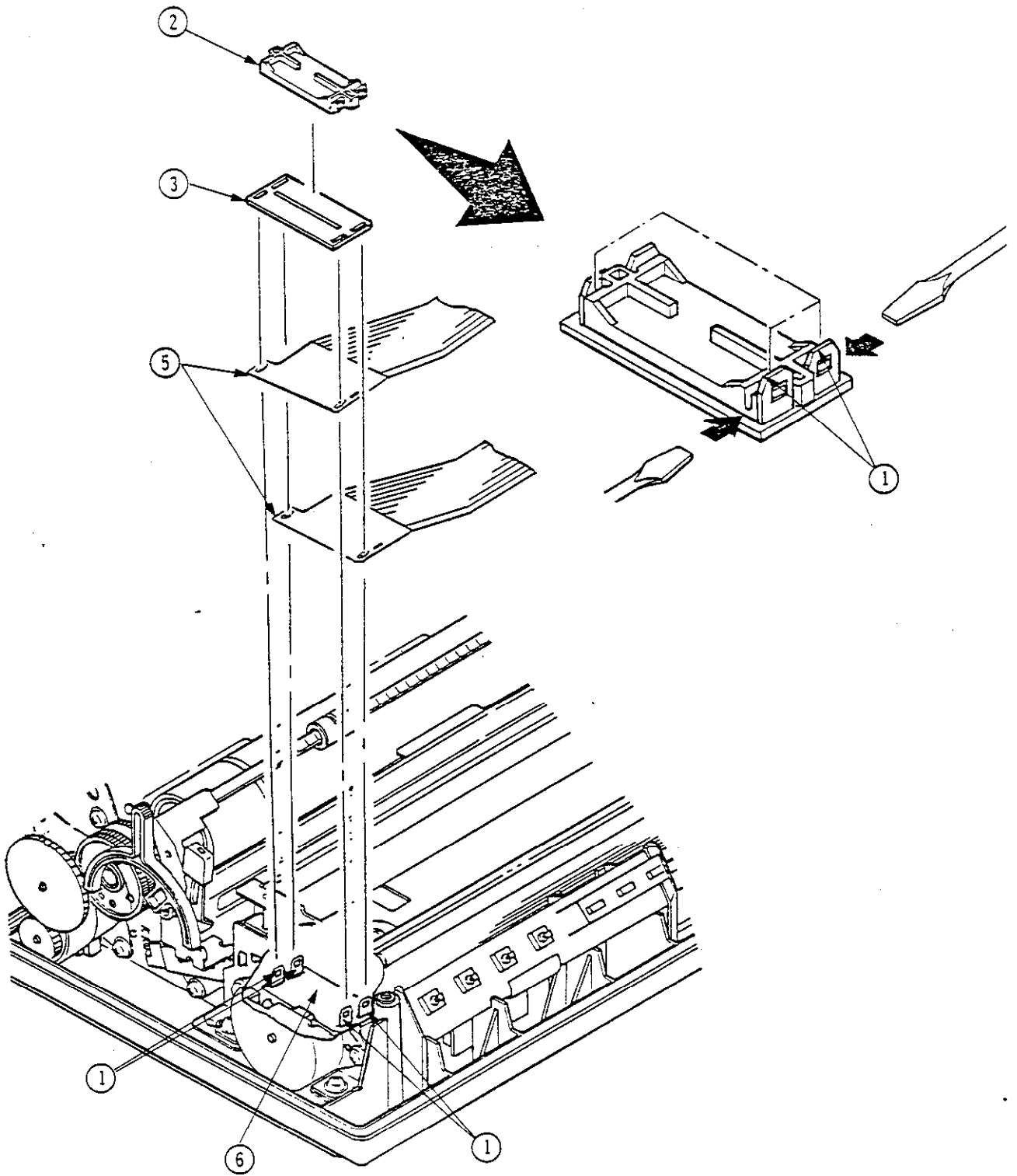


3.2.11 Carriage Cable

- (1) Remove the upper cover (see item 3.2.2)
- (2) Remove the ribbon cartridge.
- (3) Remove the ribbon drive assembly (see item 3.2.10)
- (4) Remove the printhead (see item 3.2.6).
- (5) Remove the space motor assembly (see item 3.2.8)
- (6) Remove the space rack (see item 3.2.9).
- (7) Unlock the four tabs ① with a slotted screwdriver, insert another slotted screwdriver between the cable clamp ② and the contact rubber ③, and remove the cable clamp.
- (8) Remove, the contact rubber ③.
- (9) Remove two carriage cables ⑤ from the clips ① of the circuit board support.
- (10) Remount in the reverse sequence from the removal procedure.

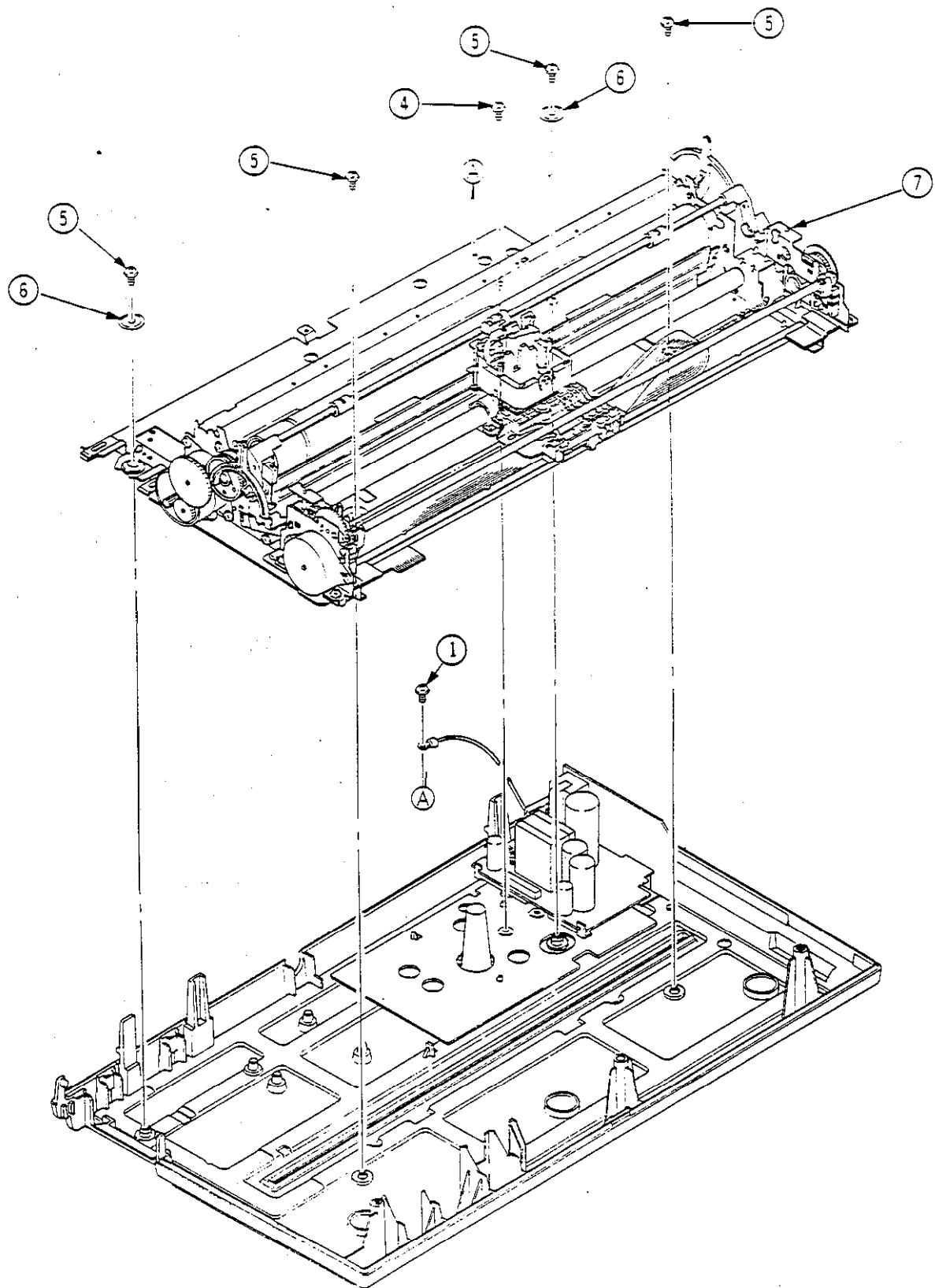
Notes:

1. To prevent loose connections, do not touch the uncovered (crimped) pins of the carriage cable ③ and connection board ⑥, and do not permit dust to accumulate on these pins.
2. Take care of hole positions when fastening two carriage cables as shown in the figure.
3. After remounting the space motor assembly, check the gap between the platen and printhead, and adjust the gap (see Section 5).



3.2.12 Printing Mechanism

- (1) Remove the personality module package (see item 3.2.1).
- (2) Remove the upper cover (see item 3.2.2).
- (3) Remove the *main control* board (see item 3.2.3).
- (4) Remove the power supply unit (see item 3.2.4).
- (5) Remove the operation board (see item 3.2.5).
- (6) Undo a screw ④.
- (7) Undo four-screws ⑤ and two washers ⑥ to remove printing mechanism ⑦
- (8) Remount in the reverse sequence from the the removal procedure.

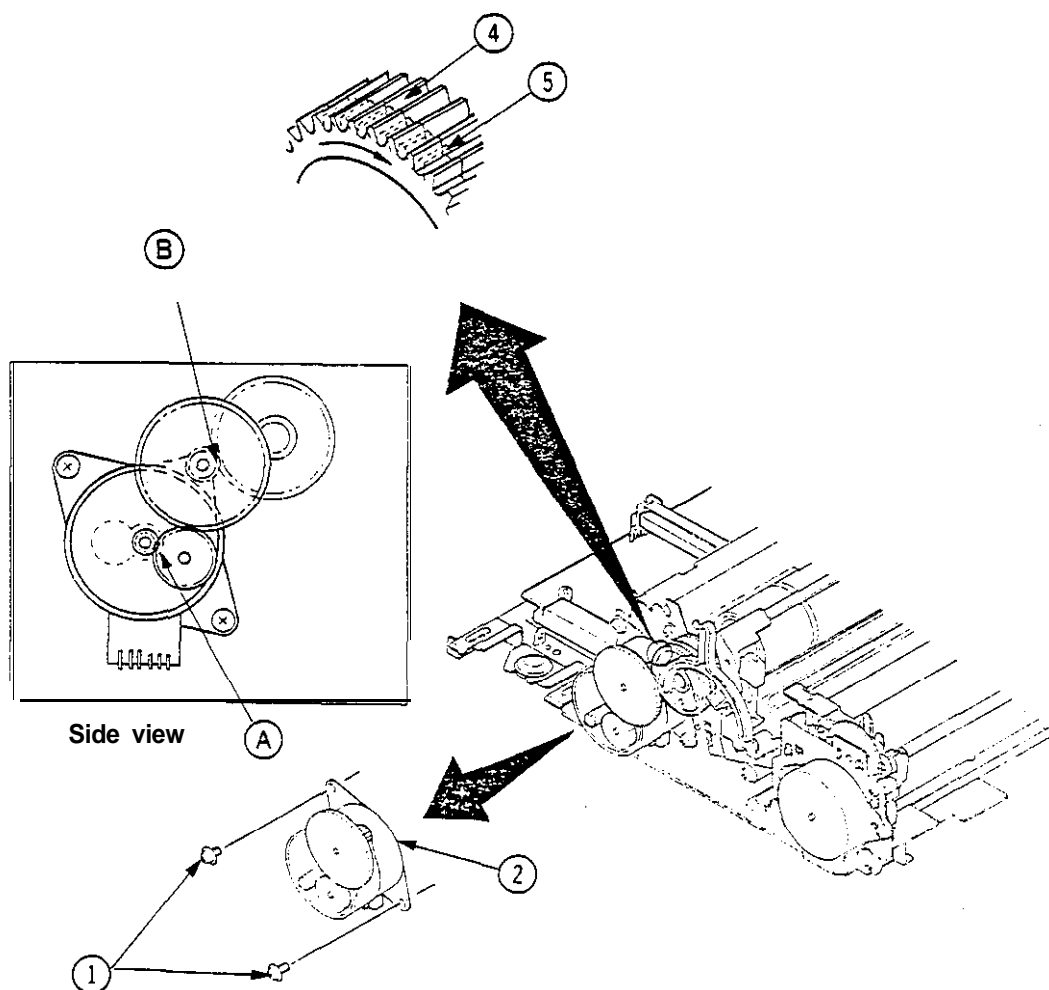


3. 2. 13 LF Motor Assembly

- (1) Remove the upper cover (see item 3.2.2).
- (2) Remove the printing mechanism (see item 3.212, but removing the main control board) is not necessary.
- (3) Undo two screws ① to remove the LF motor assembly ②.
- (4) Remount in the reverse sequence from the removal procedure.

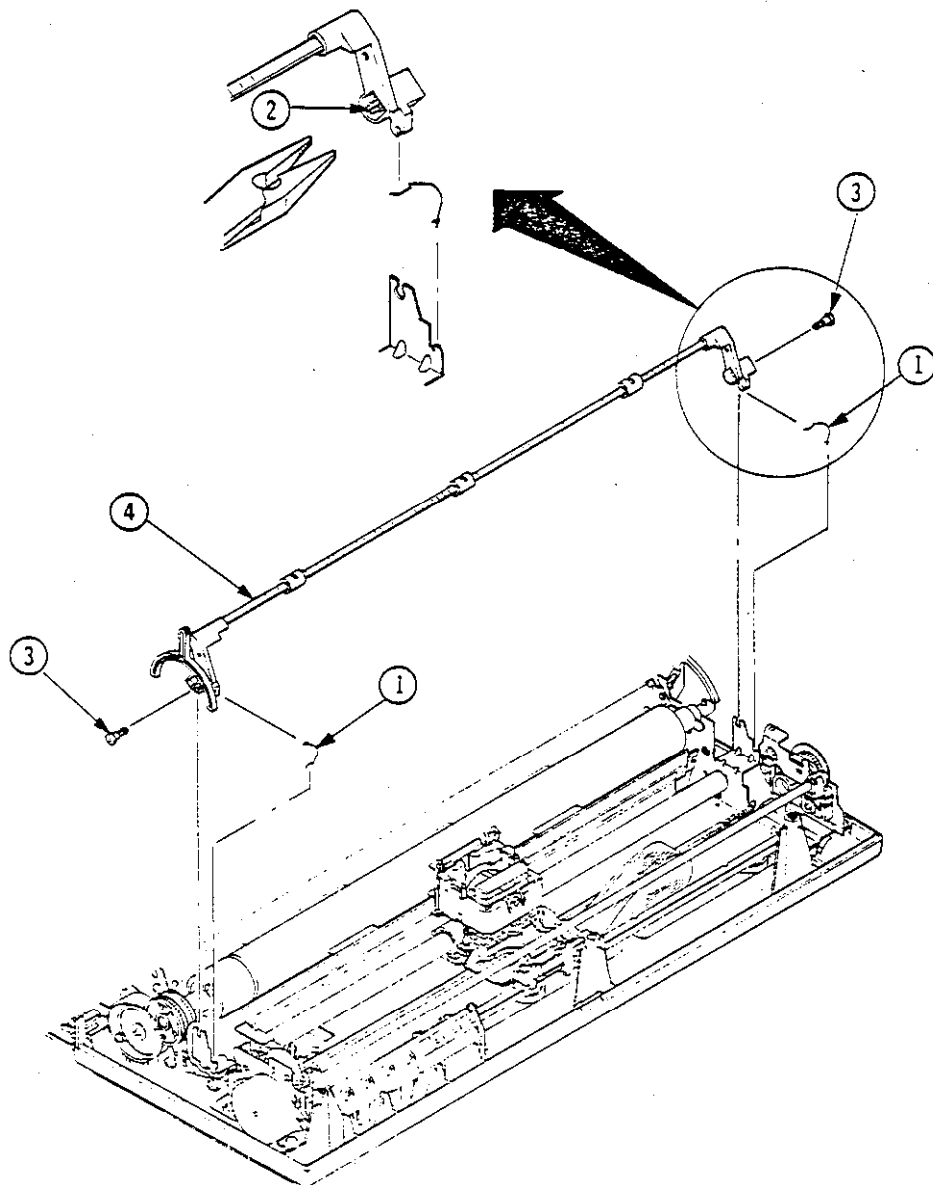
Notes:

1. Do not bend or touch the uncovered (crimped) pins of the LF motor assembly ②. And do not permit dust to accumulate on these pins.
2. When remounting the LF motor assembly ②, teeth of the platen gear ④ and bias gear ⑤ must be arranged in the same position and mesh the teeth ③ of both gears. Since there is a discrepancy of approx. quarter pitch between the bias gear and the platen gear, be careful/ for remounting two teeth of both gears in the same position.
3. When remounting the LF motor assembly ②, push the LF motor assembly to position ③.
4. After mounting, confirm the secure mesh of both gears at the position ③, and the smooth rotation of the platen.



3.2.14 Column Indicator Assembly

- (1) Remove the upper cover [see item 3.2.2].
- (2) Remove the ribbon cartridge.
- (3) Remove the two springs ① (the Left and Right front pressure springs).
- (4) Pinch and push the uncovered shaft pin ② out and remove the two push-shafts ③. Then set the head gap adjustment lever to position 3.
- (5) Remove the column indicator bar ④.
- (6) Remount in the reverse sequence from the removal procedure.

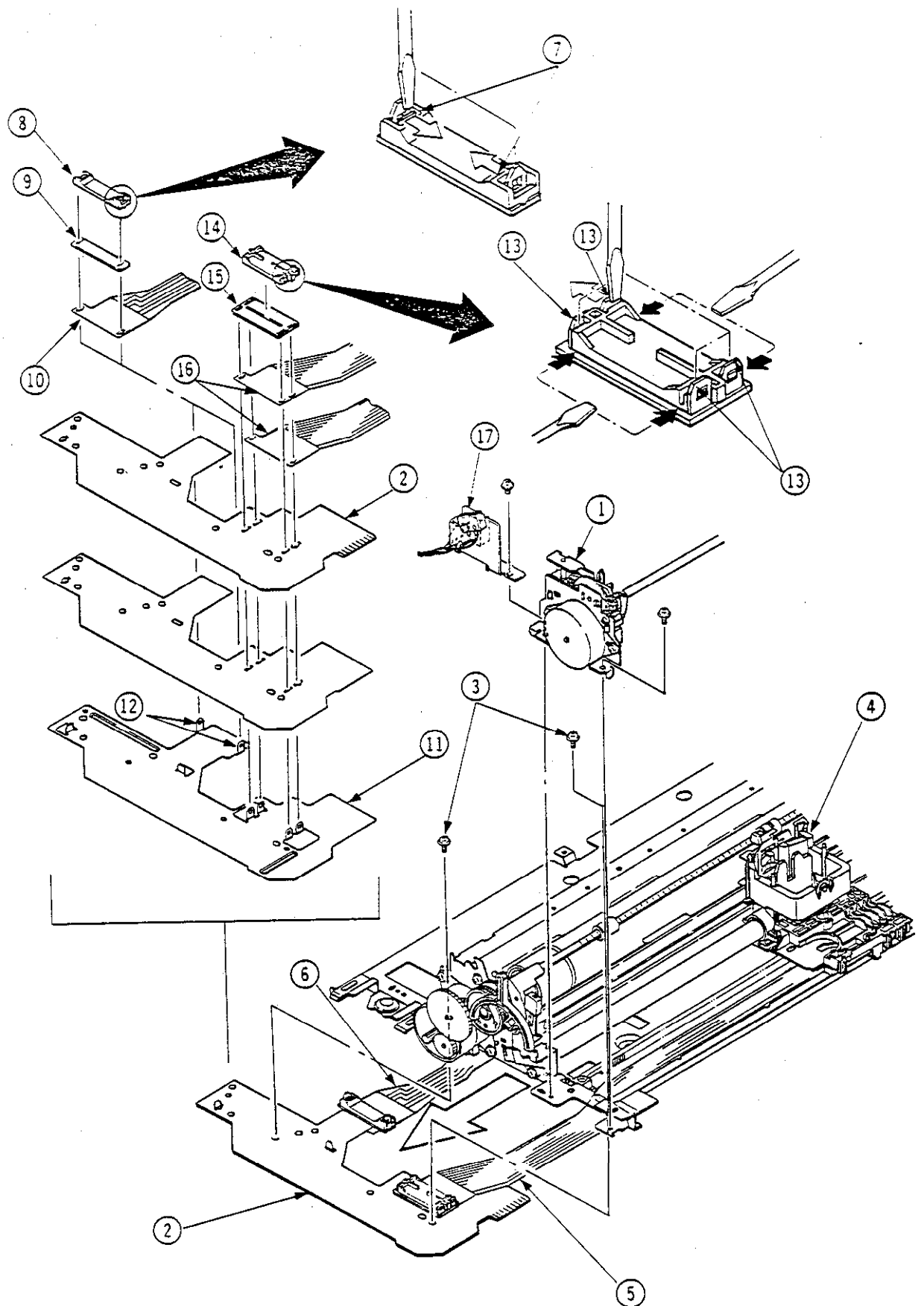


3.2.15 Connection Board

- (1) Remove *the* upper cover (see item 3.2.2).
- (2) Remove the ribbon cartridge.
- (3) Remove the printing mechanism (see item 3.2.12).
- (4) Remove the ribbon drive assy (1) and semi-auto sheet feed assy (17) (See item 3.2.10)
- (5) Remove the two screws (3) fastening the connection board (2).
- (6) Move the carriage (4) across to the left hand side.
- (7) Pull out the carriage cable (5) and base cable (6) to the left, with the connection board (2) by lifting up the left side.
- (8) Disengage two tabs (7) with a screwdriver, and remove the cord clamp (8) contact rubber (9) and the base cable (10) from the circuit board.
- (9) Disengage the four tab (13) of the fastening with a screwdriver, remove the cord clamp (14), the contact rubber (15) and the carriage cables (16) from the circuit board (11).
- (10) Separate the connection board (2) from the printed circuit board support (11).
- (11) Remount in the reverse sequence from the removal procedure.

Notes:

1. *Handle the carriage cable (5) carefully to do not bend.*
2. *Do not touch or bend any of the uncovered (crimped) pins and do not permit dust to accumulate on these pins.*

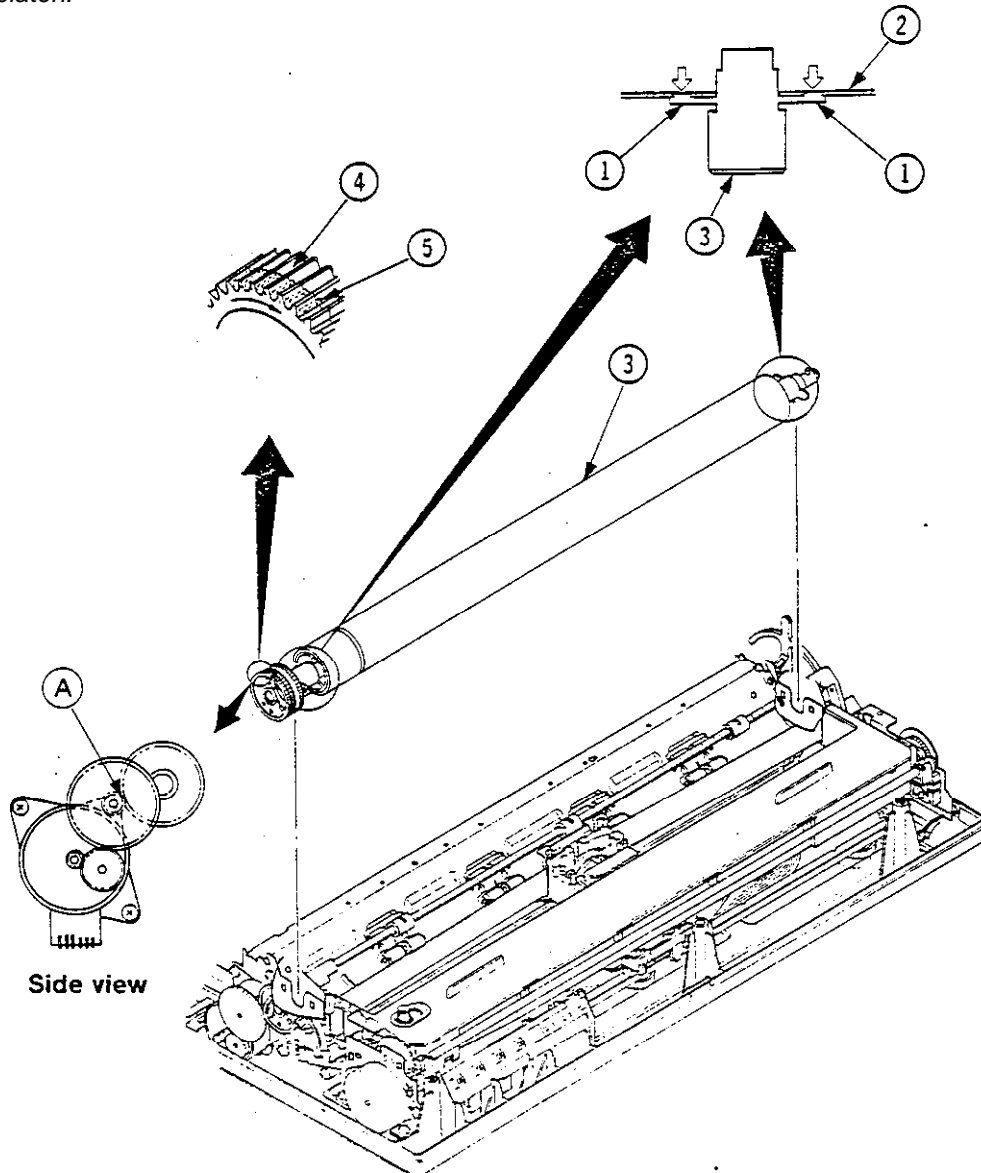


3.2.16 Platen Assembly

- (1) Remove the upper cover (see item 3.2.2)
- (2) Carefully disengage the four rabs ① (two on both sides) to remove the platen from the side plates ②.
- (3) Remove the platen assembly ③
- (4) Remount in the reverse sequence from the removal procedure.

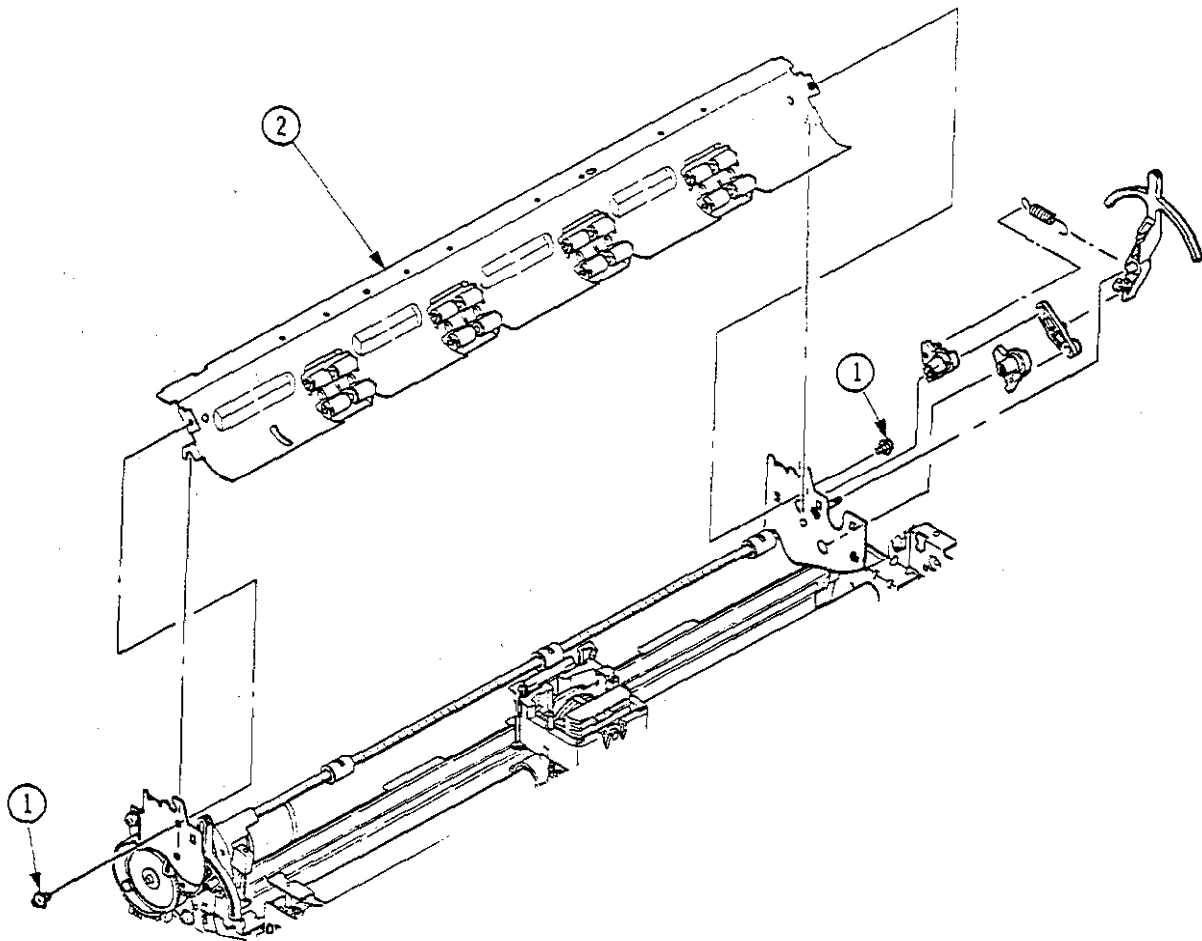
Notes:

1. When mounting the platen assembly, teeth of the platen gear ④ and bias gear ⑤ must be arranged in the same position and mesh the teeth Ⓐ of the LF motor gear. (Since there is a discrepancy of approx. quarter pitch between the bias gear and the platen gear, be careful for remounting, two teeth of both gears in the same position.)
2. After remounting, confirm the secure mesh of gears at Ⓐ and the smooth rotation of the platen.



3.217 Paper Chute Assembly

- (1) Remove the upper cover (see item 3.2.2).
- (2) Remove the platen assembly (see item 3.2.15).
- (3) Undo the two screws (1) [one on each side] and remove the paper chute assembly (2).
- (4) Remount in the reverse sequence from the removal procedure.



4. CLEANING.

4. CLEANING

Notes:

1. Always switch the AC power off **before** cleaning.
2. Keep the mechanical section free of paper refuse and others.

Clean the following parts inside the printer at the specified intervals

Cleaning interval:	Clean after every 6 months, or 300 hours of use, whichever is the shortest.
Time required:	Approximately 10 minutes
Cleaning tool:	Dry cloth (soft cloth such as gauze)
Positions to be cleaned:	See Table 4-1

Table 4-1 Position to be cleaned

Position to be cleaned	Cleaning details
Carriage shaft and vicinity	Remove all paper refuse, and clean out ribbon waste, and other dust and grime.
Paper feed route	
Paper end sensor	Wipe the sensor clean of dust.
Ribbon homing sensor	Wipe the sensor clean of dust.

5. ADJUSTMENT

5. Adjustment

Adjustments contents

- 5.1 Parallelism between platen and printhead
- 5.2 Platen and printhead gap
- 5.3 Ribbon motor mounting position adjustment
- 5.4 Ribbon height adjustment

5.1 Parallelism Between Platen and Printhead

(1) Adjusting points

Left end, center, and right end of platen (three points)

(2) Adjustment procedure

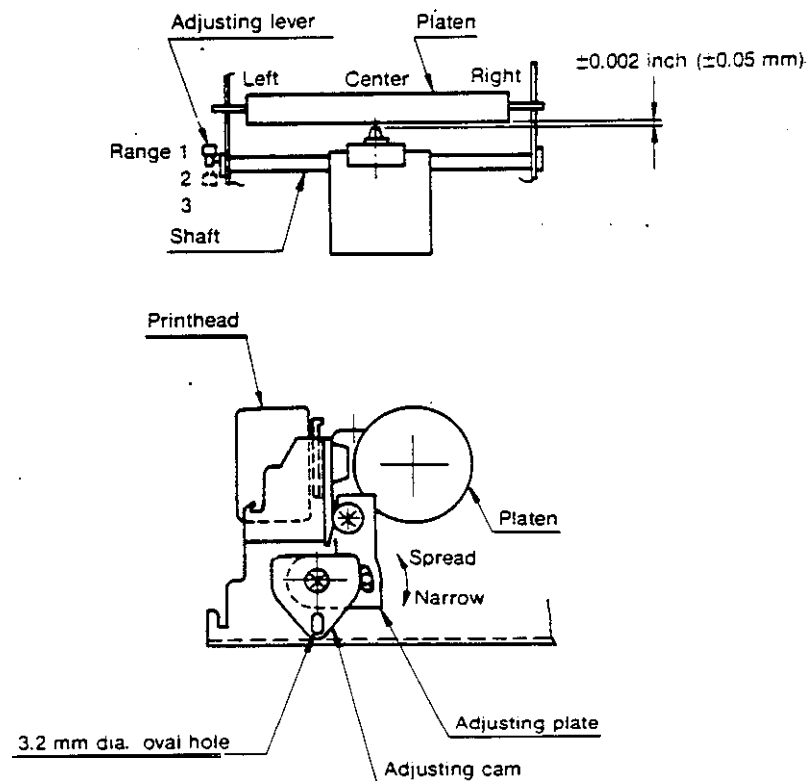
(a) Set the adjusting lever to range 1.

(b) First align the 3.2 mm dia. oval hole of the adjusting cam to the base frame oval hole.

(c) Rotate the adjusting plate on the right hand side frame, and adjust the printhead parallel to the platen.

(d) The parallel tolerance is 0.002 inch (± 0.05 mm).

Note: Keep the release lever OPEN during the adjustment.



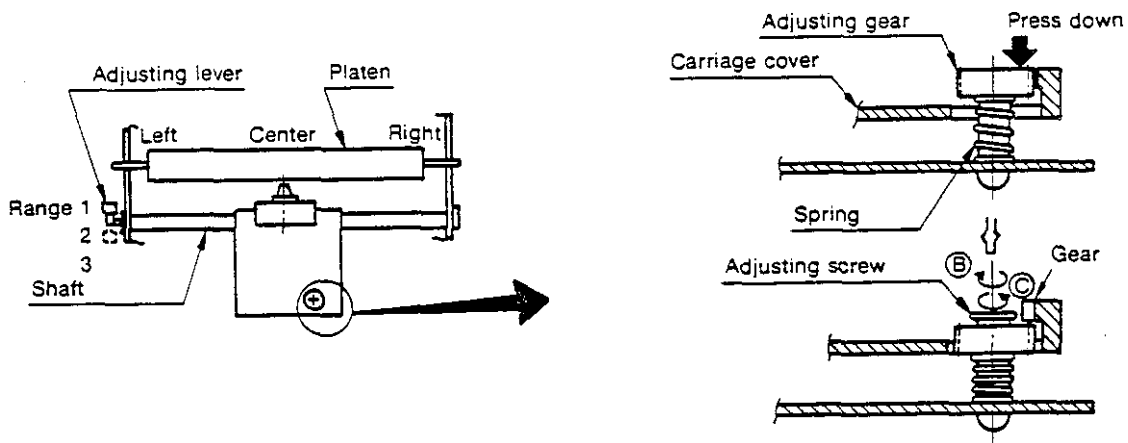
5.2 Platen and Printhead Gap

(1) Adjusting points

- (a) Left end, center, and right end of platen (three points)
- (b) Adjust in the state left to remove the ribbon protector

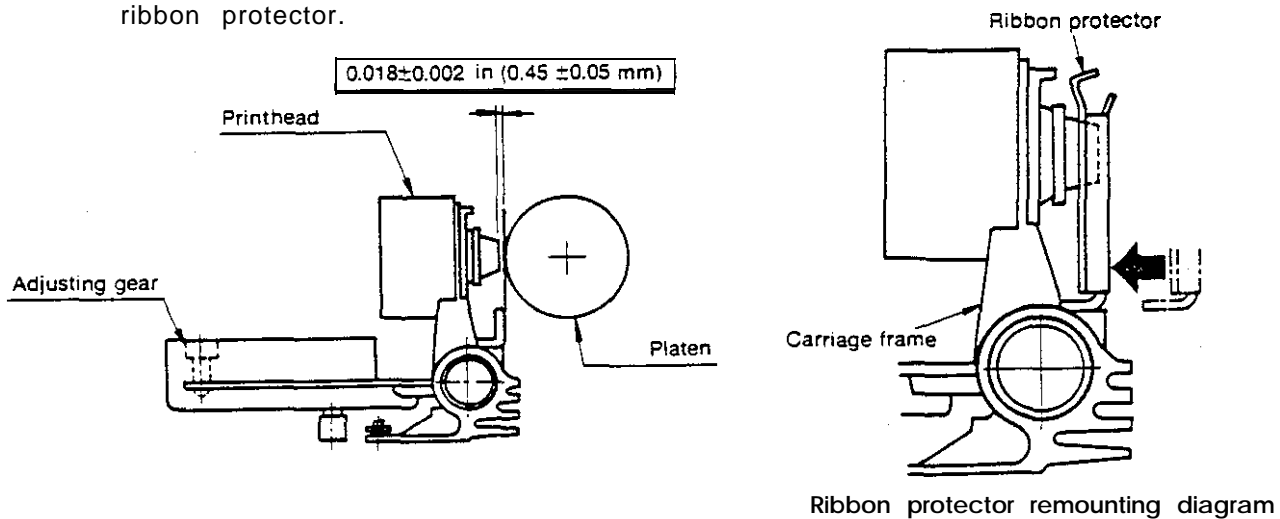
(2) Adjustment procedure

- (a) Set the paper lock release lever to the OPEN, position.
- (b) Set the adjusting lever to range 1.
- (c) Press the adjusting gear down and disengage it from the gear on the carriage cover.
- (d) Turn the adjusting screw in the appropriate direction.
(Ⓑ or Ⓒ direction in the diagram)



(3) Adjusting value

The gap must be 0.078 ± 0.002 inch (0.45 ± 0.05 mm) in the state left to remove the ribbon protector.

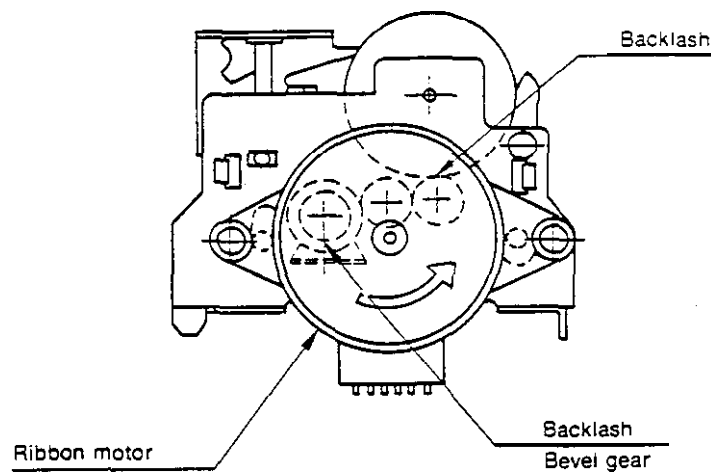


Note: Remount the ribbon protector pushing it to touch the carriage frame side.

5.3 Ribbon Motor Mounting Position Adjustment

If the ribbon motor is replaced, remount in the following way.

Rotate the ribbon motor in the arrow direction indicated in the diagram to secure the mesh of each gear, and tighten the screw when the stopper is encountered.



5.4 Ribbon Height Adjustment

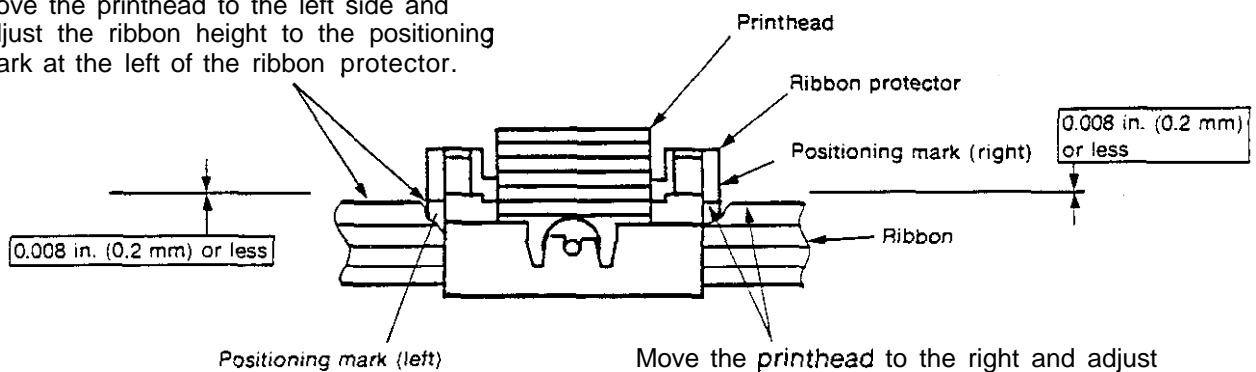
(1) Adjusting position

Adjust the ribbon height at right and left sides of the platen.

(2) Adjustment value

The discrepancy between the positioning mark of the ribbon protector and the top of the ribbon must be 0.008 inch (0.2 mm) or less.

Move the printhead to the left side and adjust the ribbon height to the positioning mark at the left of the ribbon protector.

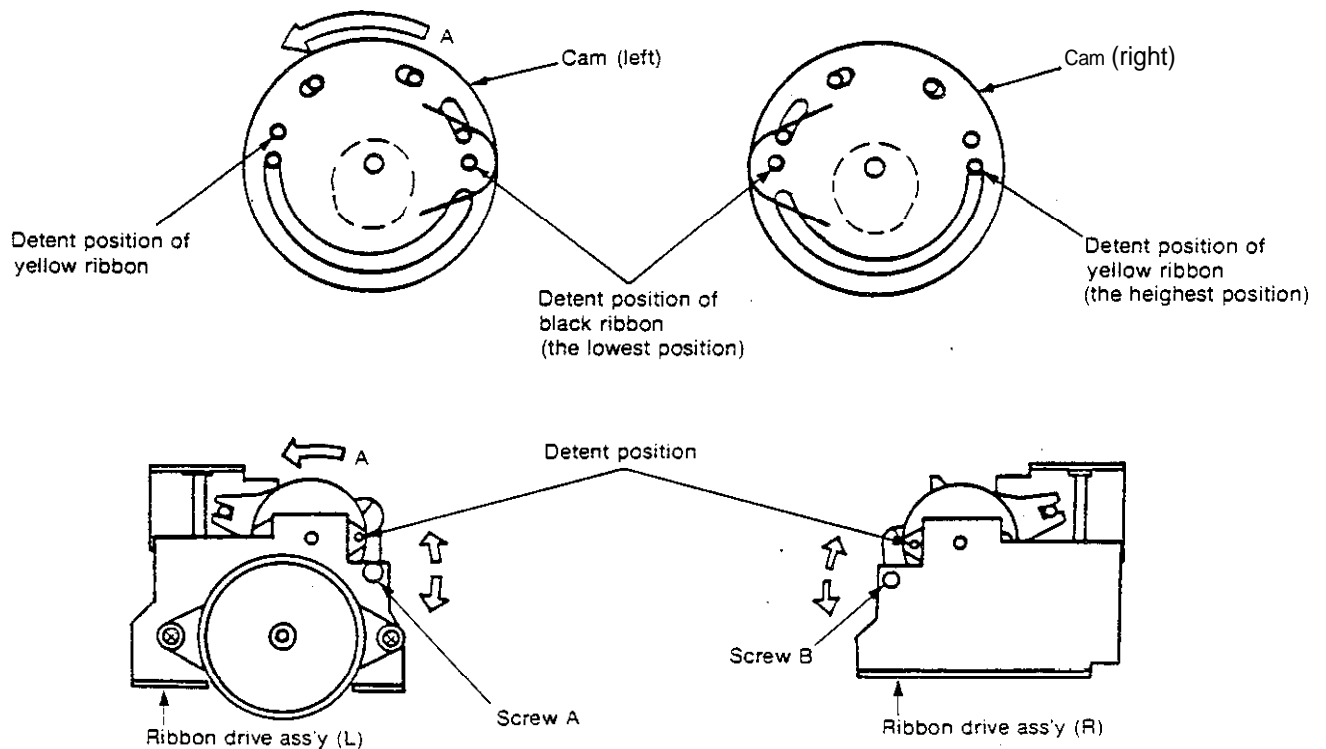


Move the printhead to the right and adjust the ribbon height to the positioning mark at the right of the ribbon protector.

(3) Adjusting method (see the figure a: the middle or the next page)

- (a) Turn the cam of the ribbon drive ass'y (L) in the direction of the arrow A and stop at the **lowest** position.
- (b) Move the print head to the left.
- (c) Undo the screw A and adjust the ribbon height to the positioning mark at the left of the ribbon protector moving the screw A up and down.
- (d) Fasten the screw A after adjusting.
- (e) Move the printhead to the right.
- (f) Undo the screw B and adjust the ribbon height to the positioning mark at the right of the ribbon protector moving the screw B up and down.
- (g) Fasten the screw B after adjusting.
- (h) When turning the left cam in the arrow direction A after adjusting, confirm no phase difference between left and right cams at the each detents.

The left and the right side adjustments are executed by screws A and B respectively. Confirm no discrepancy between the left and the right detent phases after fastening screws.



6. LUBRICATION

6. LUBRICATION

(1) Type of oil/grease

Name of oil or grease	Symbol
Alvania grease 2EP (or equivalent)	CEP
Motor oil 10W30 (or equivalent)	PM

(2) Oil quantity

	Quantity	Symbol
Normal	3 or 4 drops of oil, or about 0.2 mm of grease	Ⓐ
Small qty	About 1 drop	Ⓑ

(3) Lubricating frequency

The ML294 printer is maintenance free unit which does not require lubrication during operation. When the printer is disassembled, reassembled and lubricated parts are cleaned, however, those parts must be lubricated again.

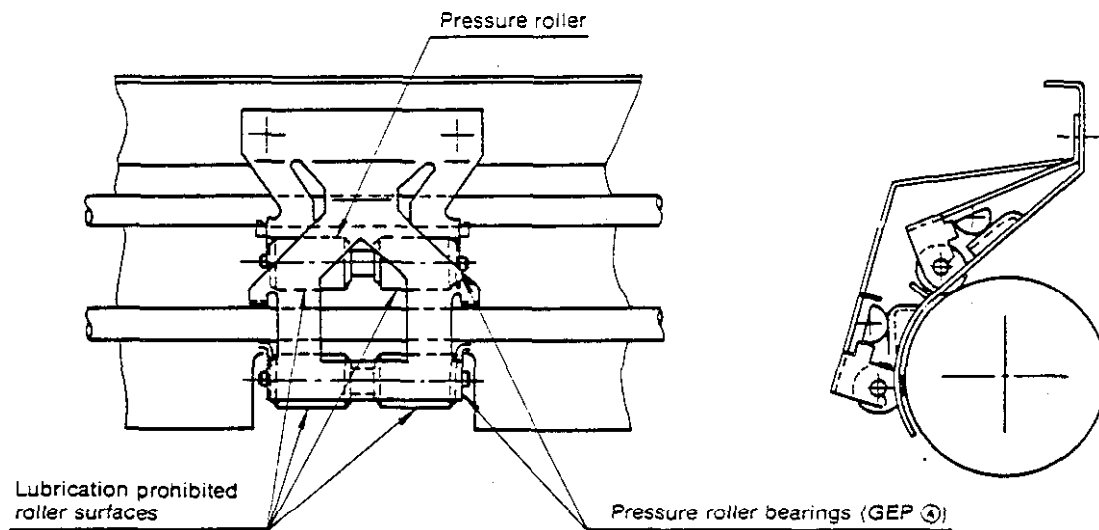
(4) Places which must not be lubricated

No.	Positions which must not be lubricated	Reason	Remarks
1	Platen surface	To prevent soiling of printing paper	
2	Pressure roller surface	To prevent soiling of printing paper and faulty feeding	Although grease is applied to the pressure roller bearings, the roller surface must be kept free of grease and oil.
3	Column indicator pressure roller	To prevent soiling of printing paper and faulty feeding	
4	Ink ribbon	To prevent printing problems	
5	Pin tractor feed unit	To prevent soiling of printing paper	
6	Flexible cable	To prevent loose connections	
7	Space motor ass'y	To prevent loose connection	

(5) Lubrication positions

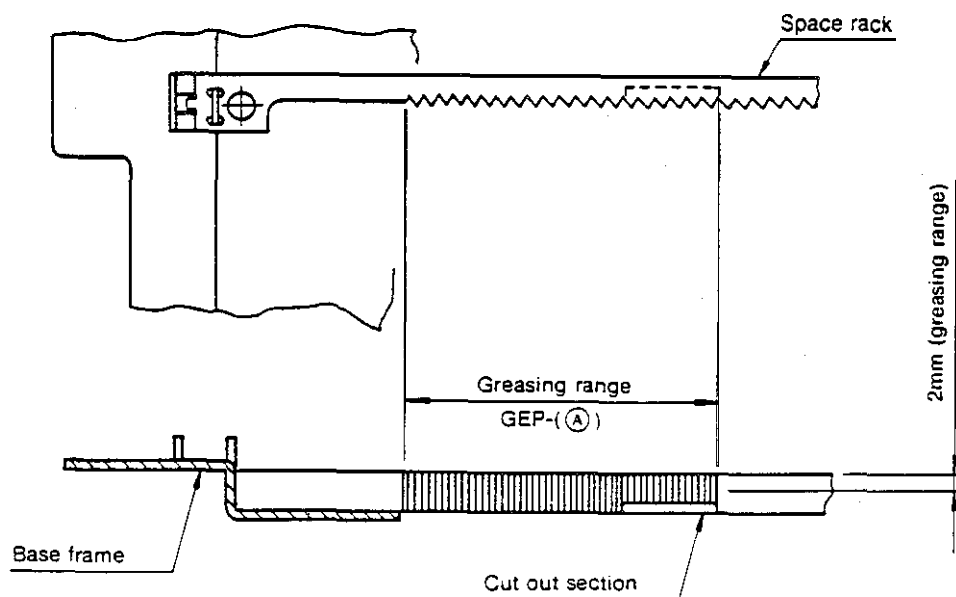
- | | |
|---------------------------|-----------------|
| !a) Pressure roller | GEP-(A) |
| (b) Space rack | GEP-(A) |
| (c) Ribbon drive assembly | PM-(A), GEP-(A) |
| (d) Ribbon guide shaft | PM-(B) |

(a) Pressure roller



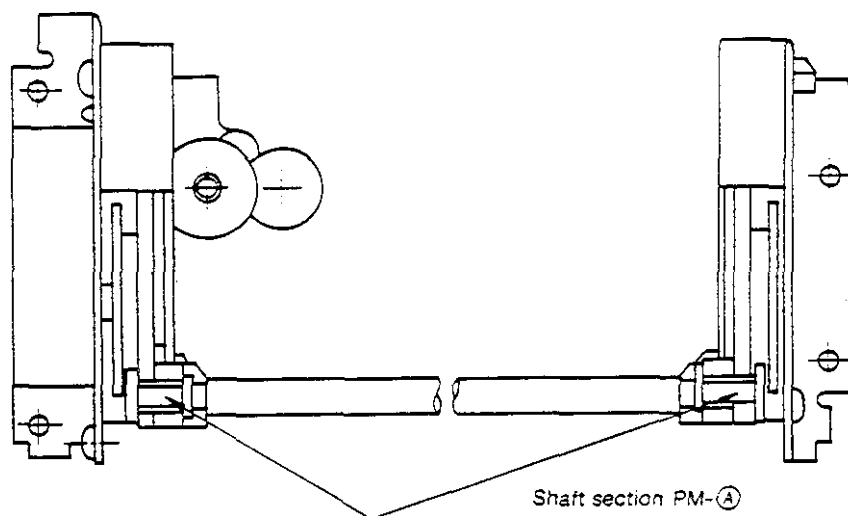
Note: Apply GEP-(A) to the 16 pressure roller *bearings*.

(b) Space rack



Note: The greasing range is from the left of the tooth up to the cut-out section, and also the bottom land on the rack surface.

(C) Ribbon Drive Assembly

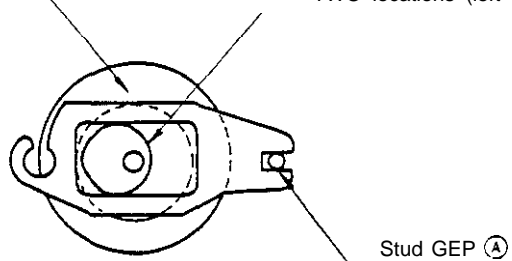


Surface in contact with gear
detent SP (rear side in this
diagram). GEP-(A)

Two locations (left and right)

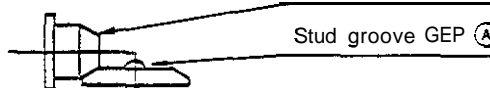
Cam surface GEP-(A) (Two locations)

TWO locations (left and right)

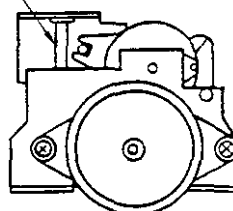


Bevel gear intermeshing GEP-(A)

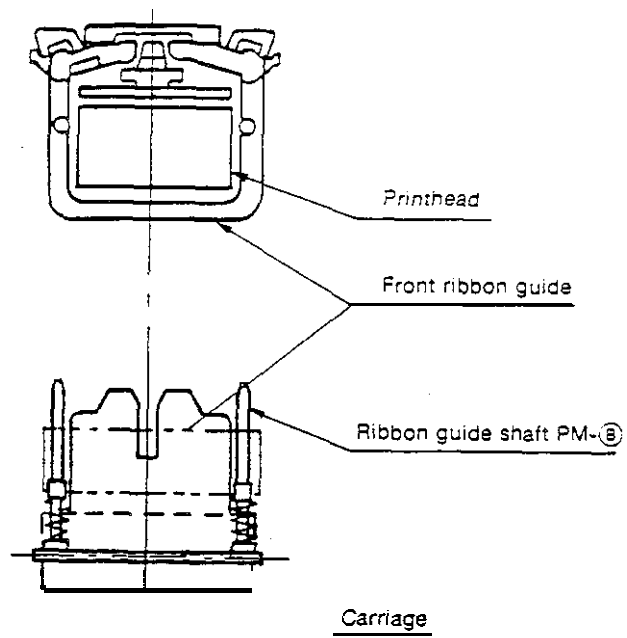
Stud groove GEP (A)



Shaft in ribbon shift bracket GEP-(A)



(d) Ribbon guide shaft



7. FAILURE REPAIR PROCEDURES

7. FAILURE REPAIR PROCEDURES

7.1 Precautions Prior to Commencing Repairs

- (1) Thoroughly check all check points described in the user's manual.
- (2) Ask the client for as much detail as possible in relation to the failure.
- (3) Examine the unit under conditions resembling the conditions when the failure occurred.

7.2 Troubleshooting Item Table

Category	Failure details	Item
Failure when power switched on.	No operation (POWER lamp off)	①
	No spacing (SELECT lamp blinking)	②
	Abnormal spacing (runaway, vibration)	③
Failure during actual printing	Incorrect printing, or missing dots	④
	No ribbon feed	⑤
	No color change of color ribbon	⑥
	No line feed	⑦
	Operation panel switches fail to work	⑧
	No data reception	⑨

7.3 Component Parts Layout

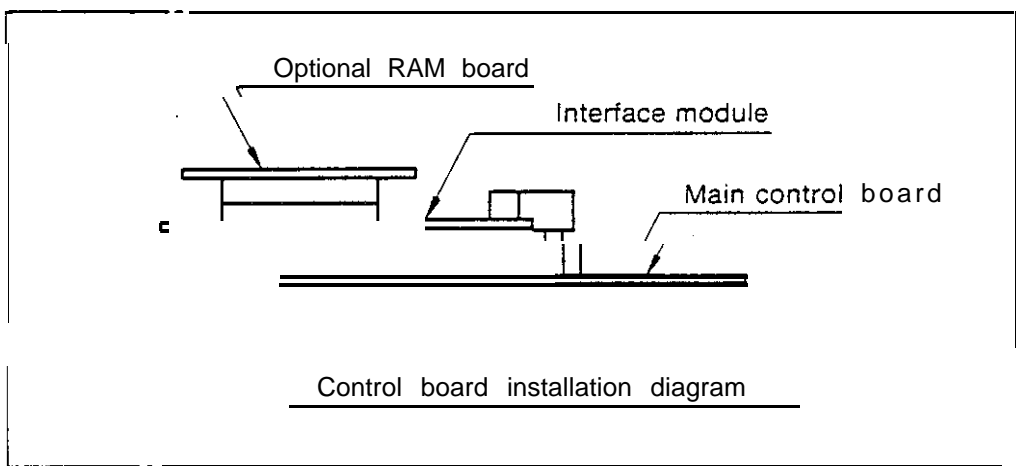
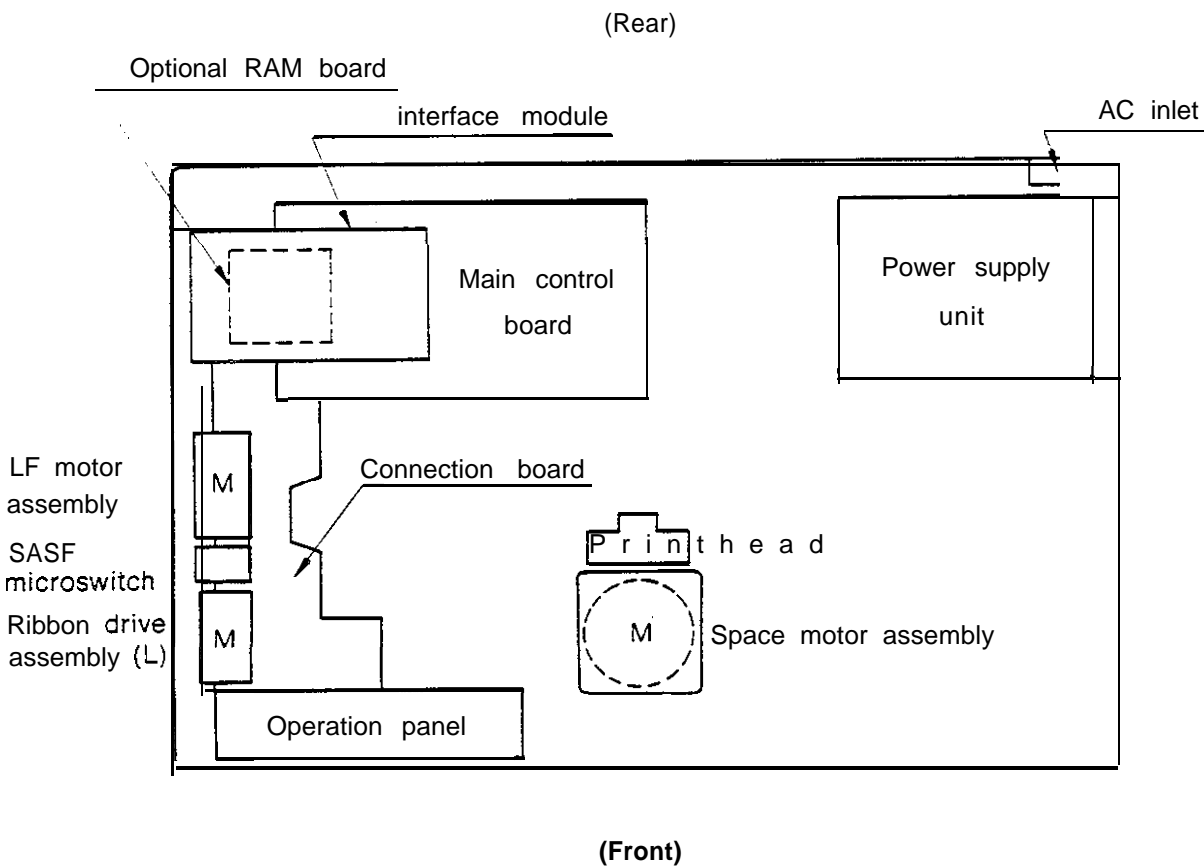


Figure 7-1

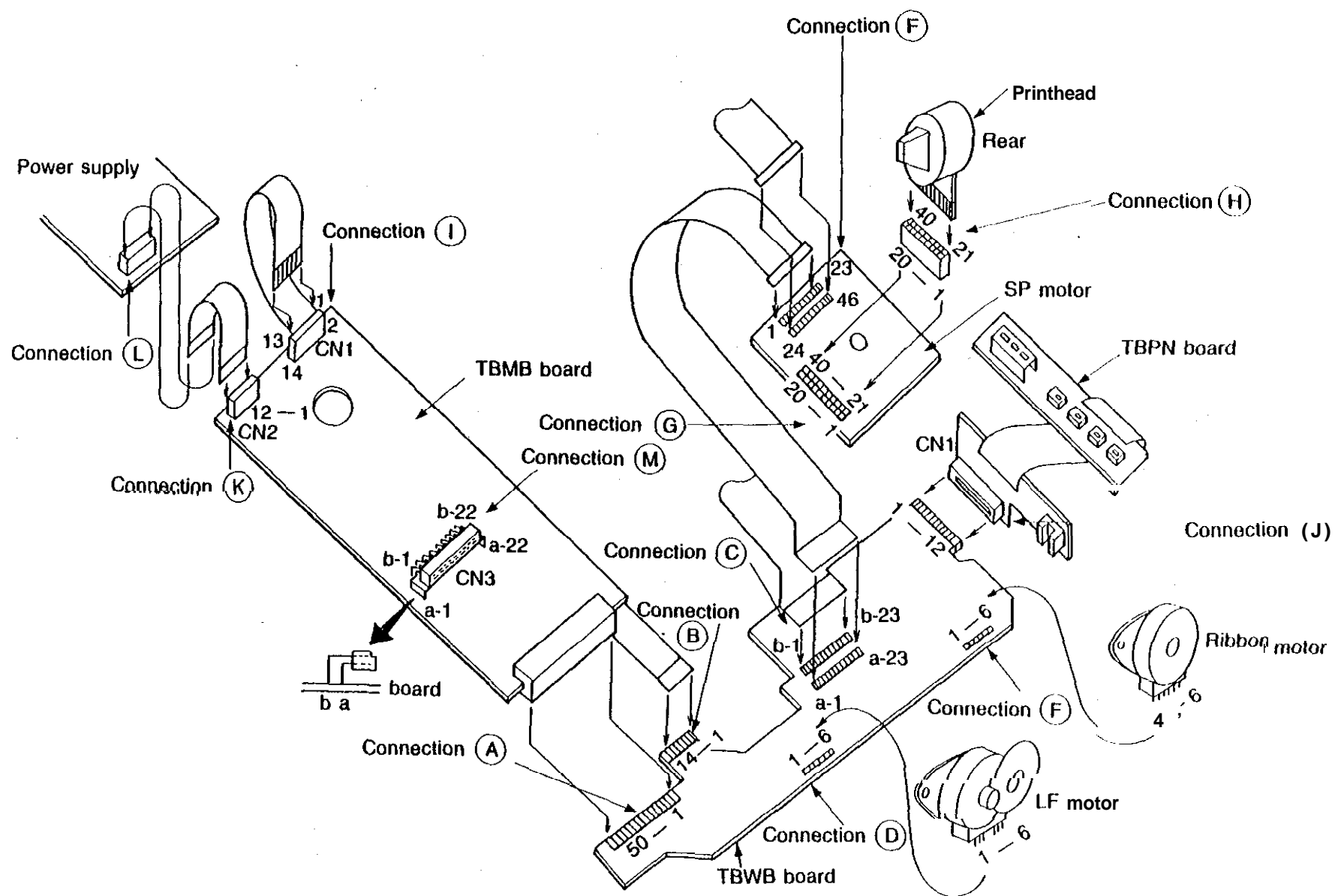
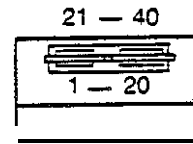
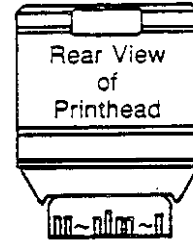


Figure 7-2 Connector Locations and Pin Numbers

Table 7-1 Connection Circuit and Resistance Check for Print Head and LF RBNSP Motor

Printhead Resistance of each coil should be about 18.5Ω

Pins at connection	Signals	Pins onprinthead
	RHC #1 RHD #1 RHC #2 RHD #2 RHC #3 RHD #3 RHC #1 RHD #1 RHC #5 RHD #5 RHC #6 RHD #6 RHC #7 RHD #7 RHC #8 RHD #8 RHC #9 RHD #9 LHC #1 LHD #1 LHC #2 LHD #2 LHC #3 LHD #3 LHC #4 LHD #4 LHC #5 LHD #5 LHC #6 LHD #6 LHC #7 LHD #7 LHC #8 LHD #8 LHC #9 LHD #9	19 20 39 40 17 18 37 38 15 16 35 36 13 14 33 34 11 12 3 2 23 22 5 4 25 24 7 6 27 26 9 8 29 28 10 9 32 31 21 — 40 1 — 20



Bottom View of Printhead

- **Line feed motor** Resistance of each coil should be about 5.4Ω

Pins at connection	Signals	Pins on LF motor												
<p>LFMO</p>	<table><tr><td>$\phi 1$</td><td>3</td></tr><tr><td>Common</td><td>2</td></tr><tr><td>$\phi 3$</td><td>1</td></tr><tr><td>$\phi 2$</td><td>4</td></tr><tr><td>Common</td><td>5</td></tr><tr><td>$\phi 4$</td><td>6</td></tr></table>	$\phi 1$	3	Common	2	$\phi 3$	1	$\phi 2$	4	Common	5	$\phi 4$	6	<p>1 — 6</p>
$\phi 1$	3													
Common	2													
$\phi 3$	1													
$\phi 2$	4													
Common	5													
$\phi 4$	6													

- **Ribbon motor** Resistance of each coil should be about 53Ω

Pins at connection	Signals	Pins on Ribbon motor
	<p>$\phi 1$</p> <p>Common</p> <p>$\phi 3$</p> <p>$\phi 2$</p> <p>$\phi 4$</p>	

- **Space motor** Resistance of each coil should be about 10.5Ω

Pins at connection	Signals	Pins on SP motor										
<p>U₁, U₂, V₁, V₂, W₁, W₂</p> <p>ϕB, ϕA</p>	<table border="1"> <tr><td>U</td><td>41</td></tr> <tr><td>V</td><td>40</td></tr> <tr><td>W</td><td>42</td></tr> <tr><td>ϕB</td><td></td></tr> <tr><td>ϕA</td><td></td></tr> </table>	U	41	V	40	W	42	ϕB		ϕA		<p>24, 23, 40, 41, 42</p>
U	41											
V	40											
W	42											
ϕB												
ϕA												

7.4 Troubleshooting Flow charts

(1) No operation at all (and POWER lamp off.)

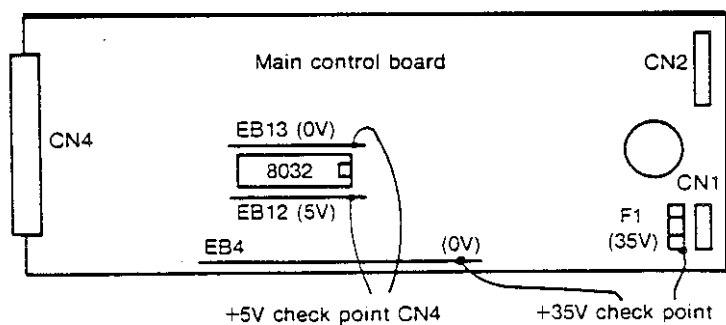
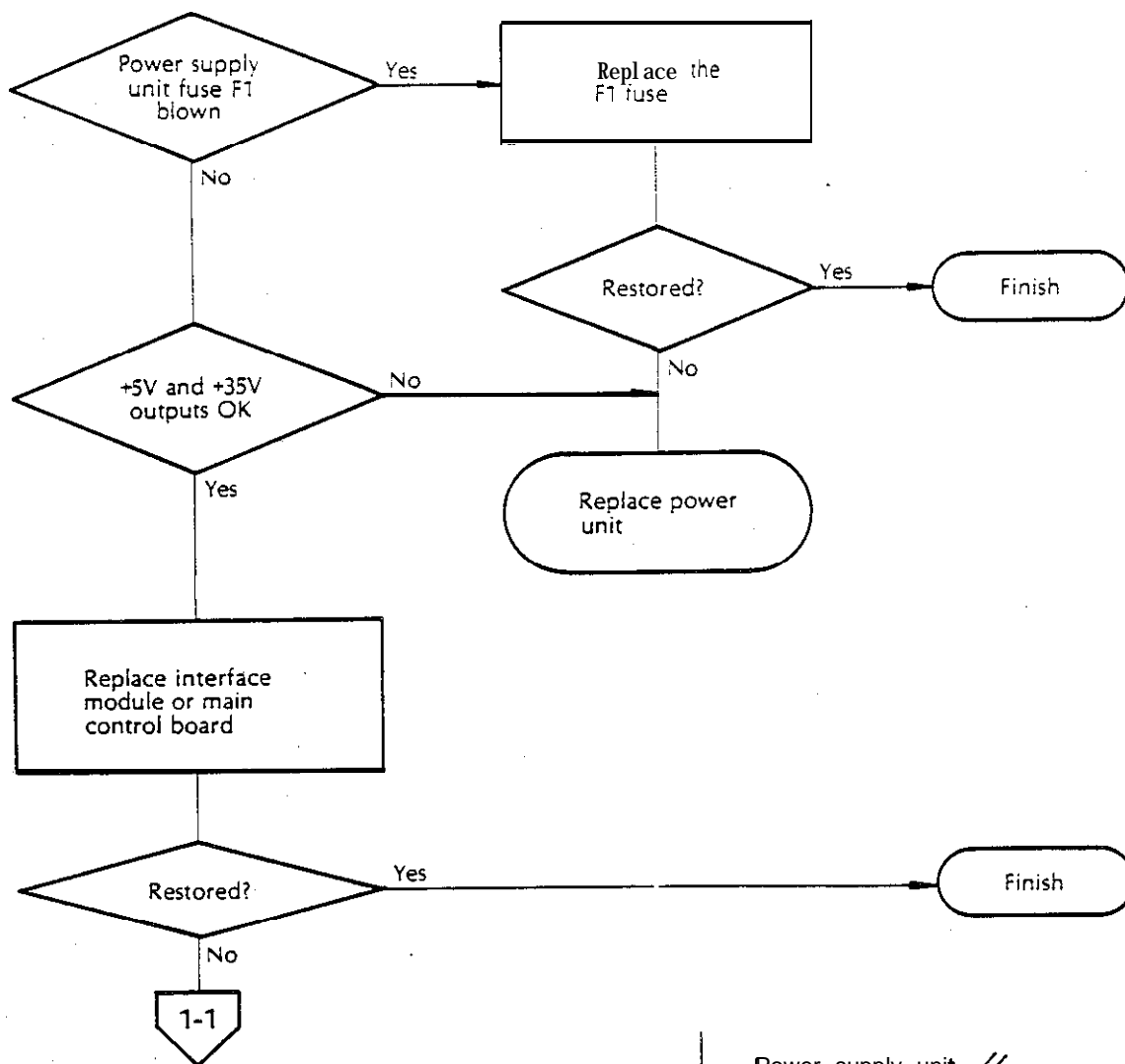
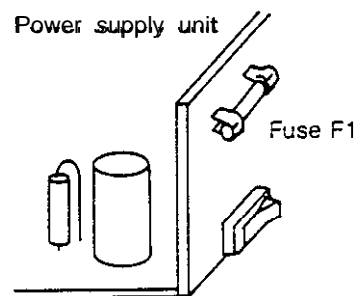
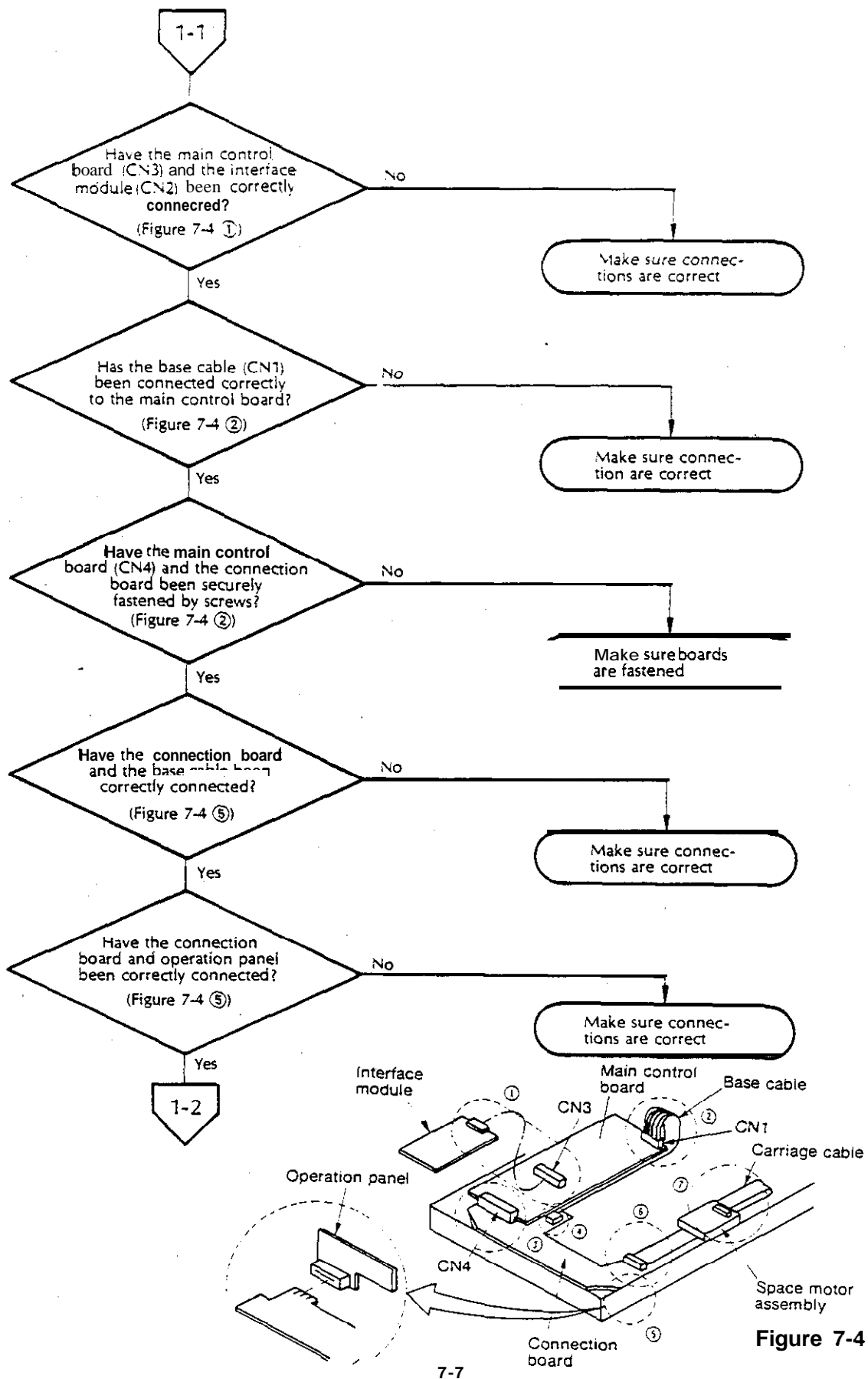
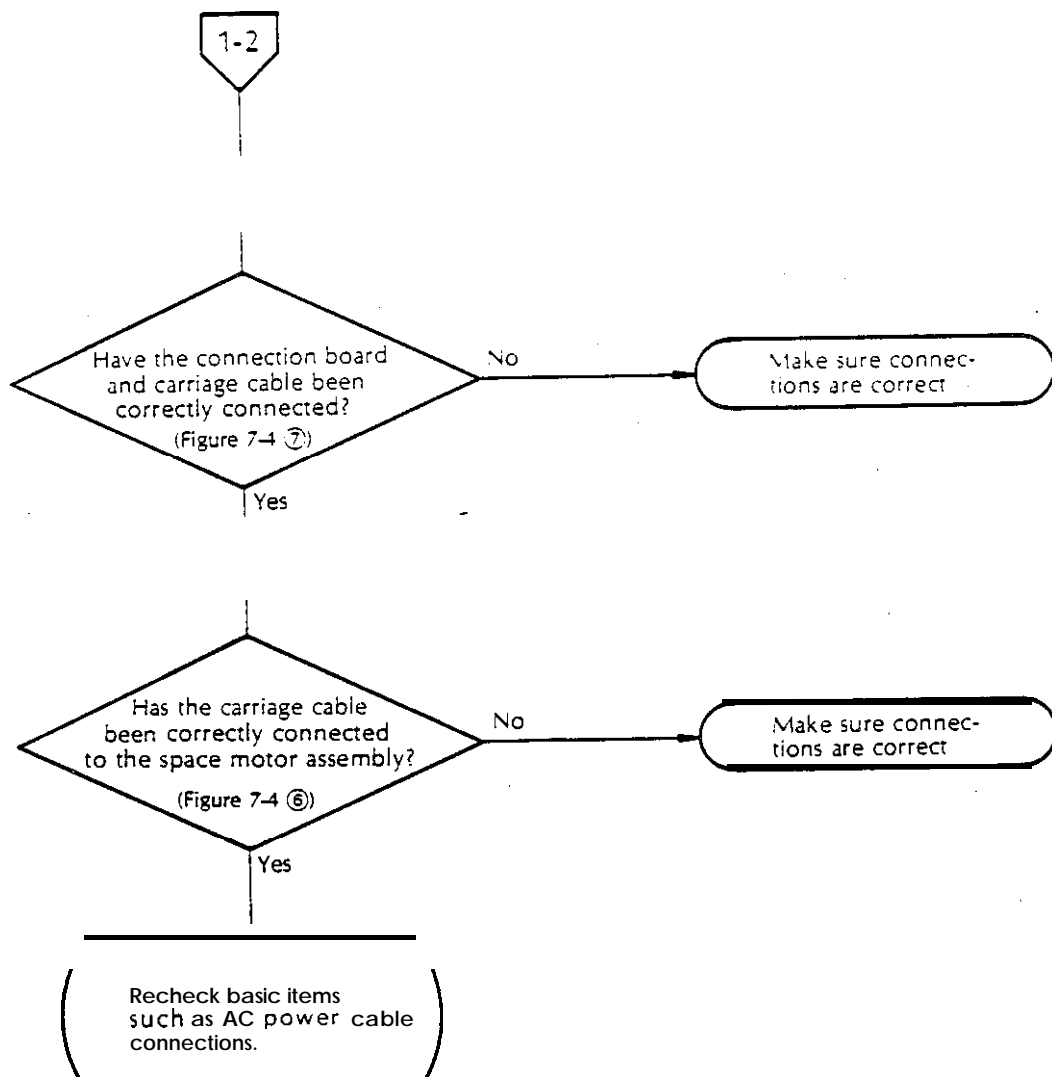


Figure 7-3



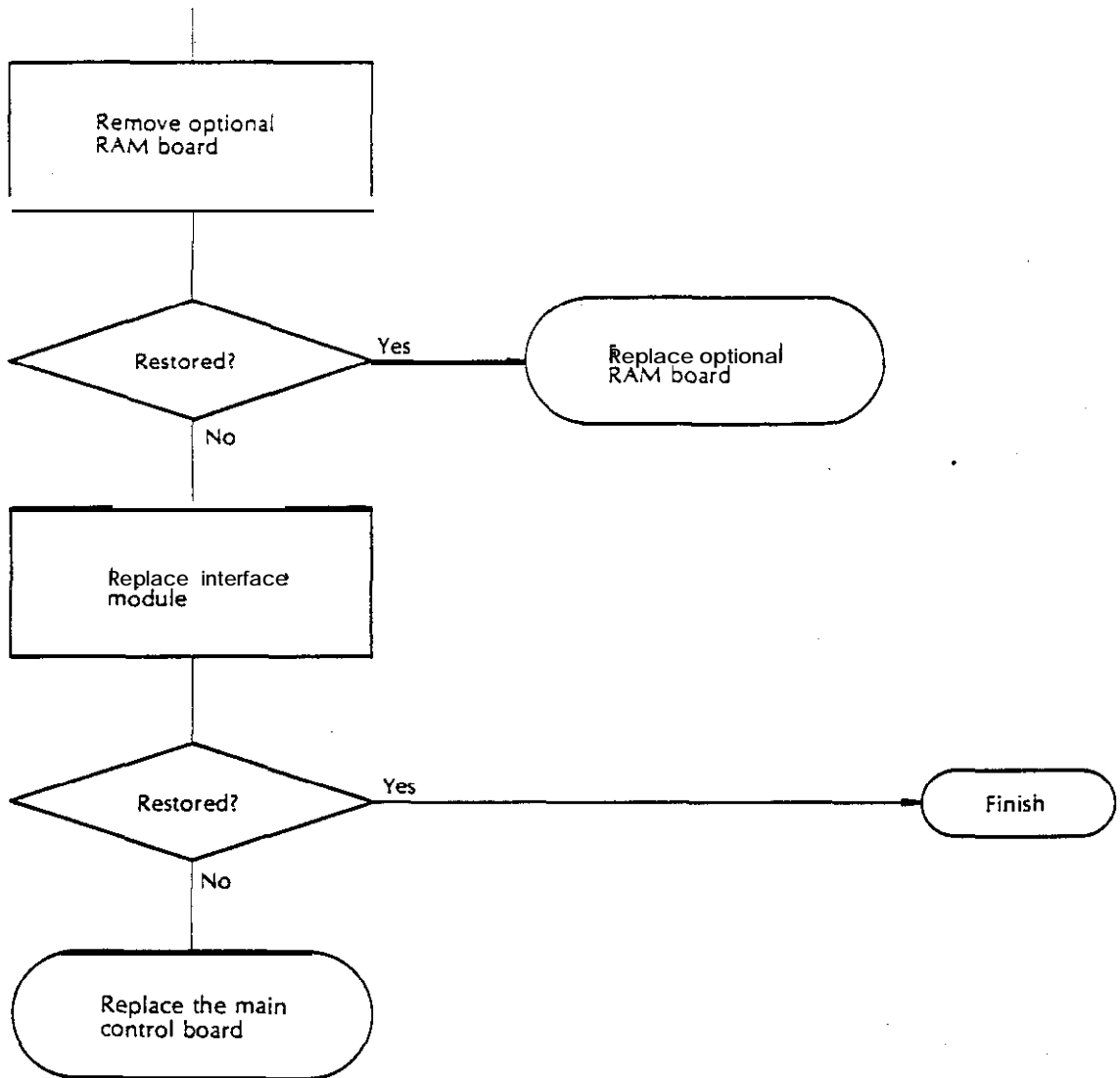


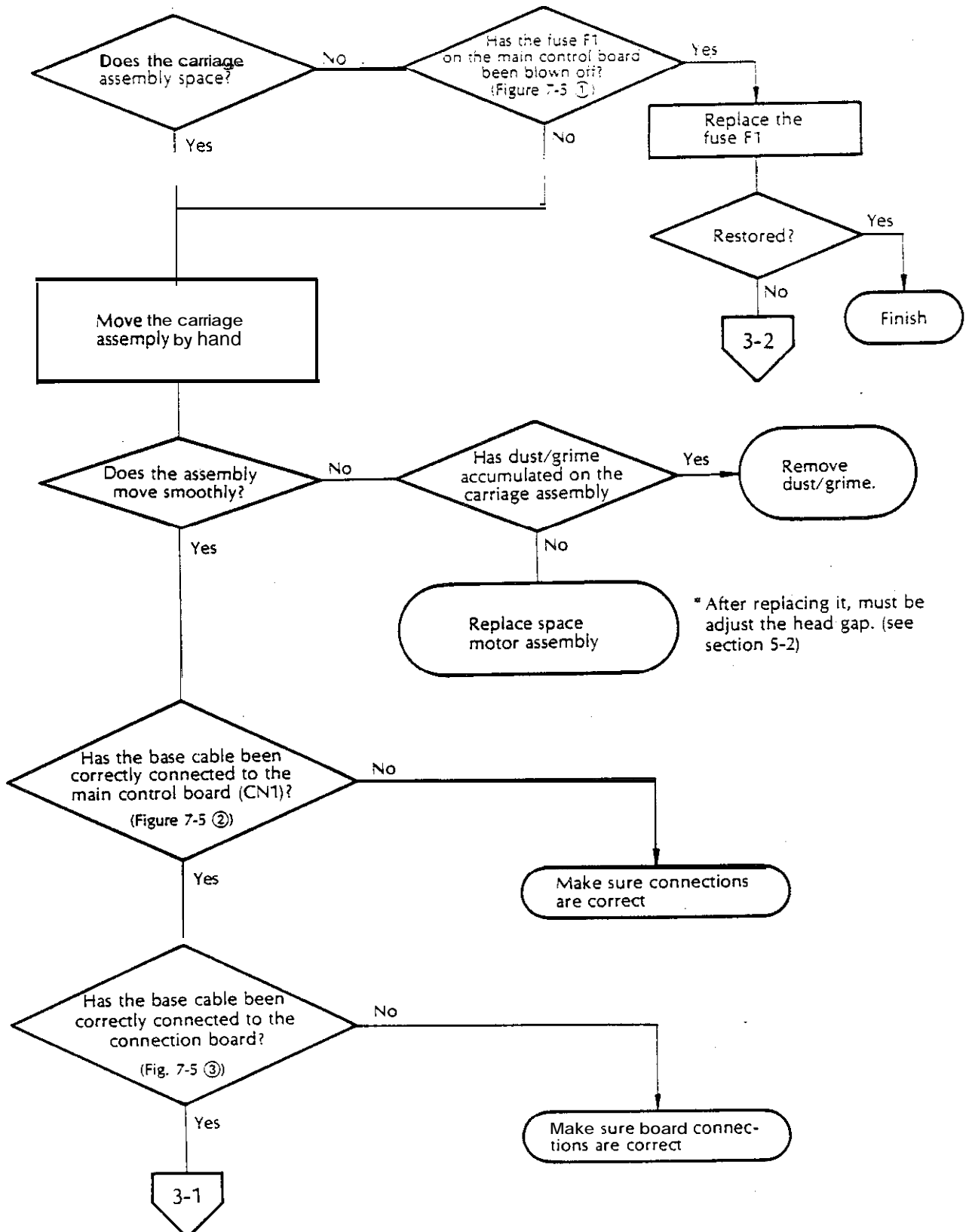


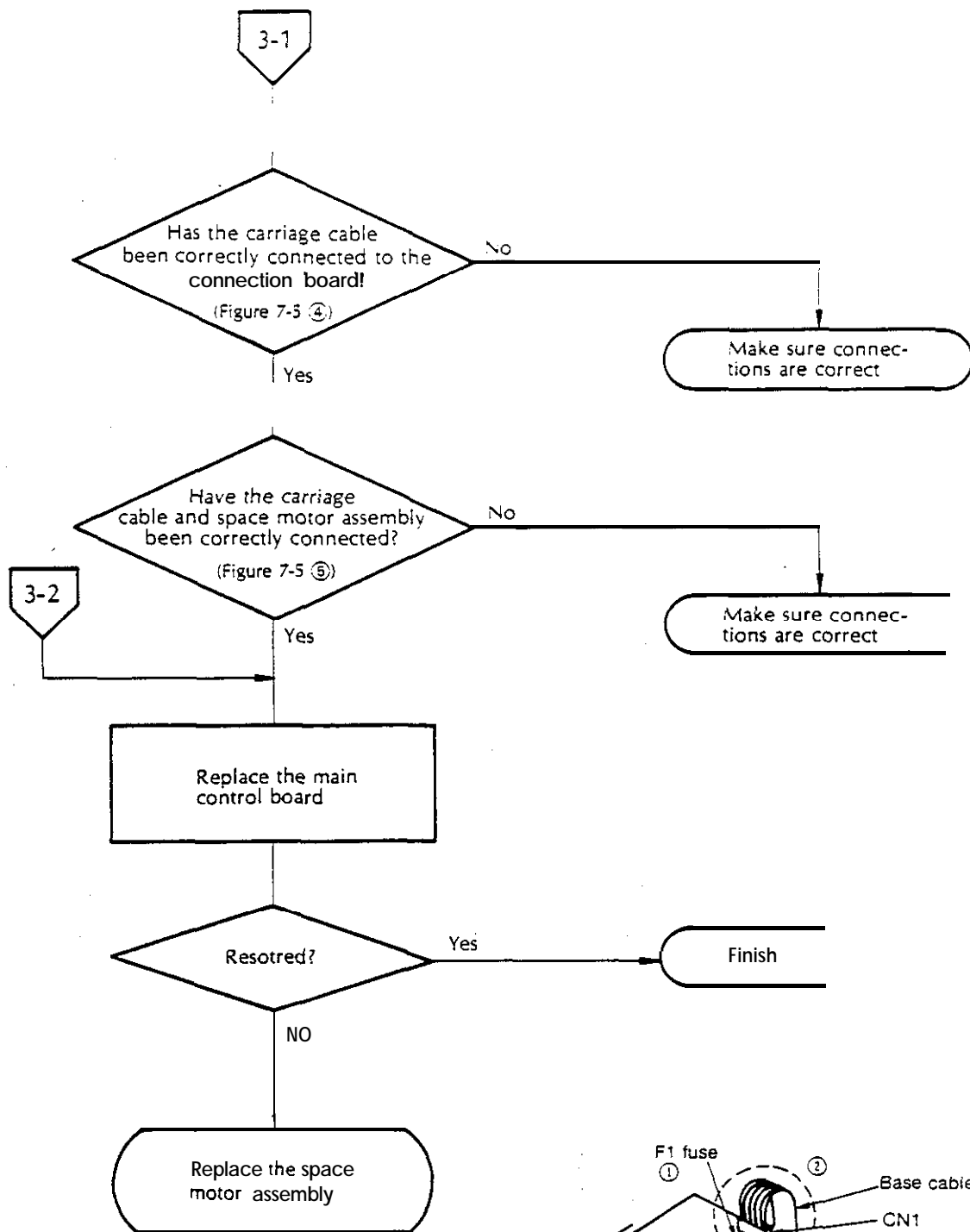
2

No spacing, (SELECT lamp blinking)

ROM/RAM check error







*After replacing it, must be adjust the head gap. (see section 5.2)

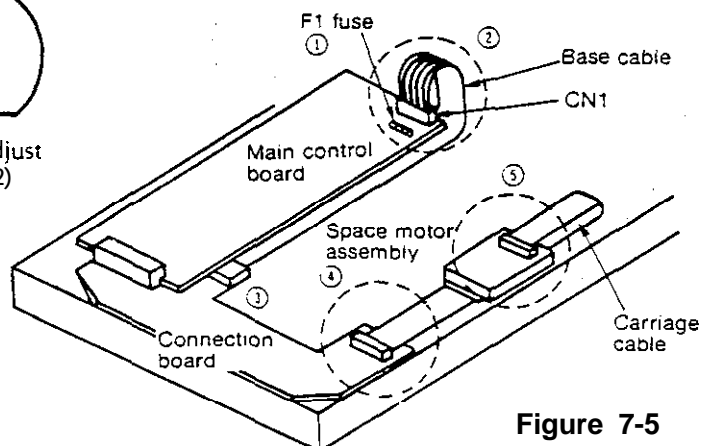


Figure 7-5

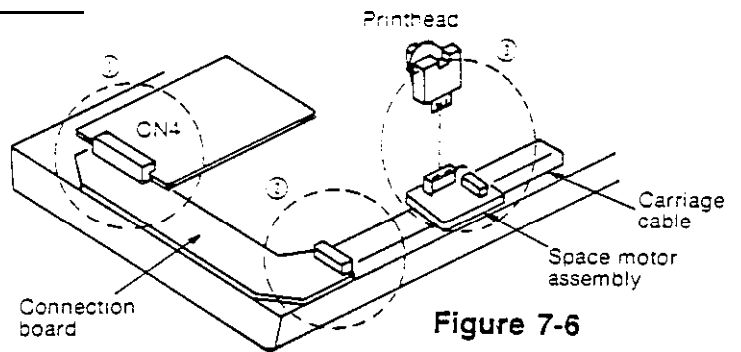
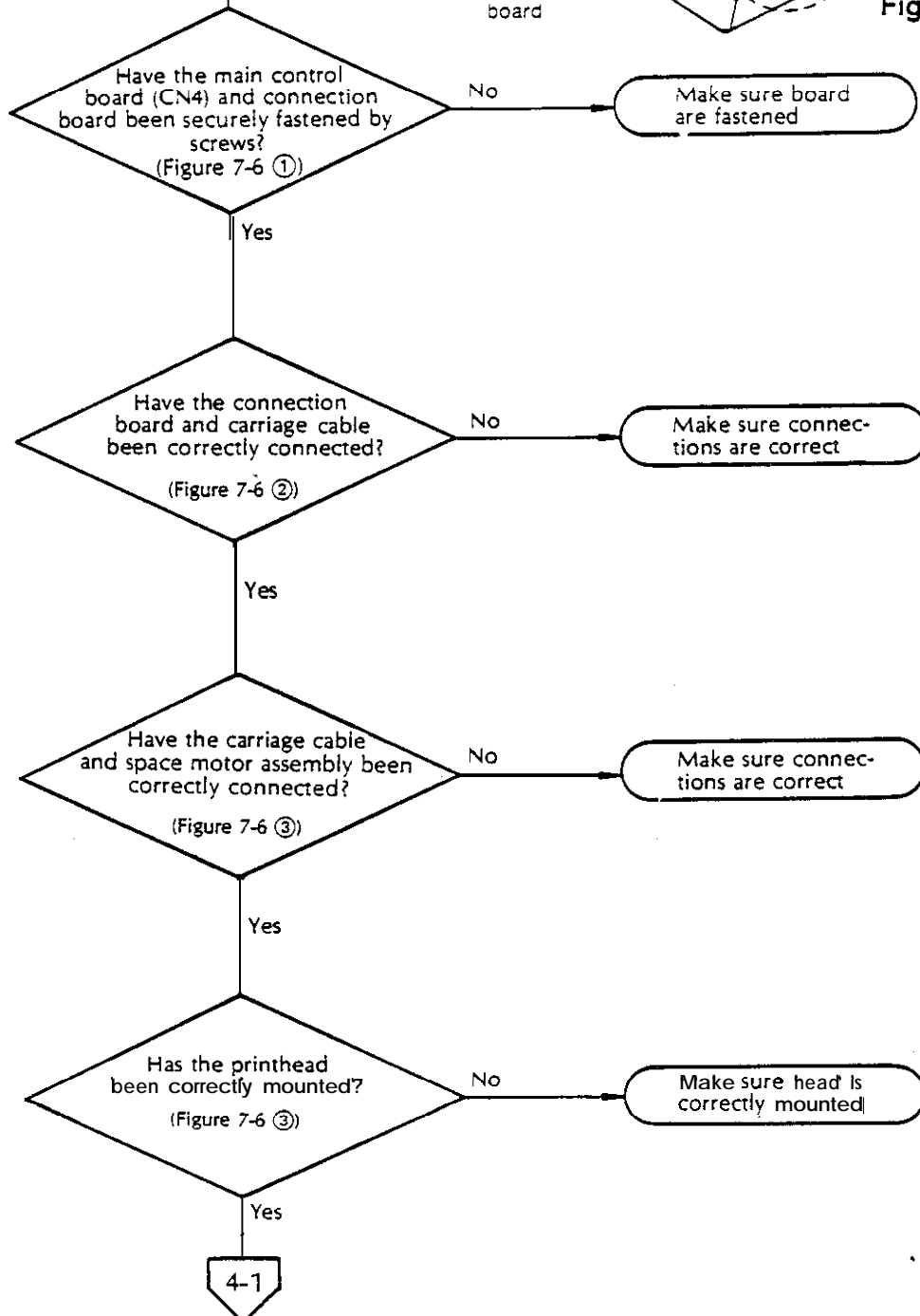
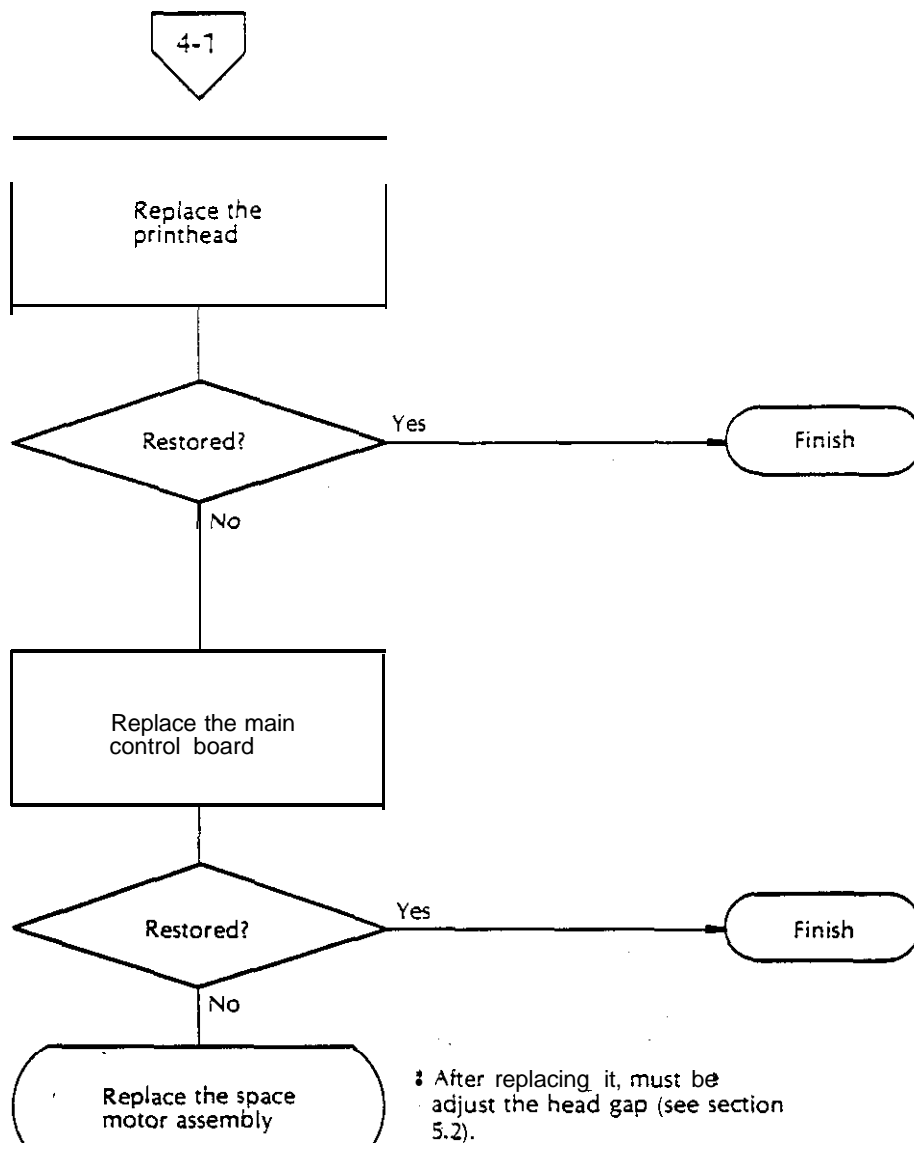


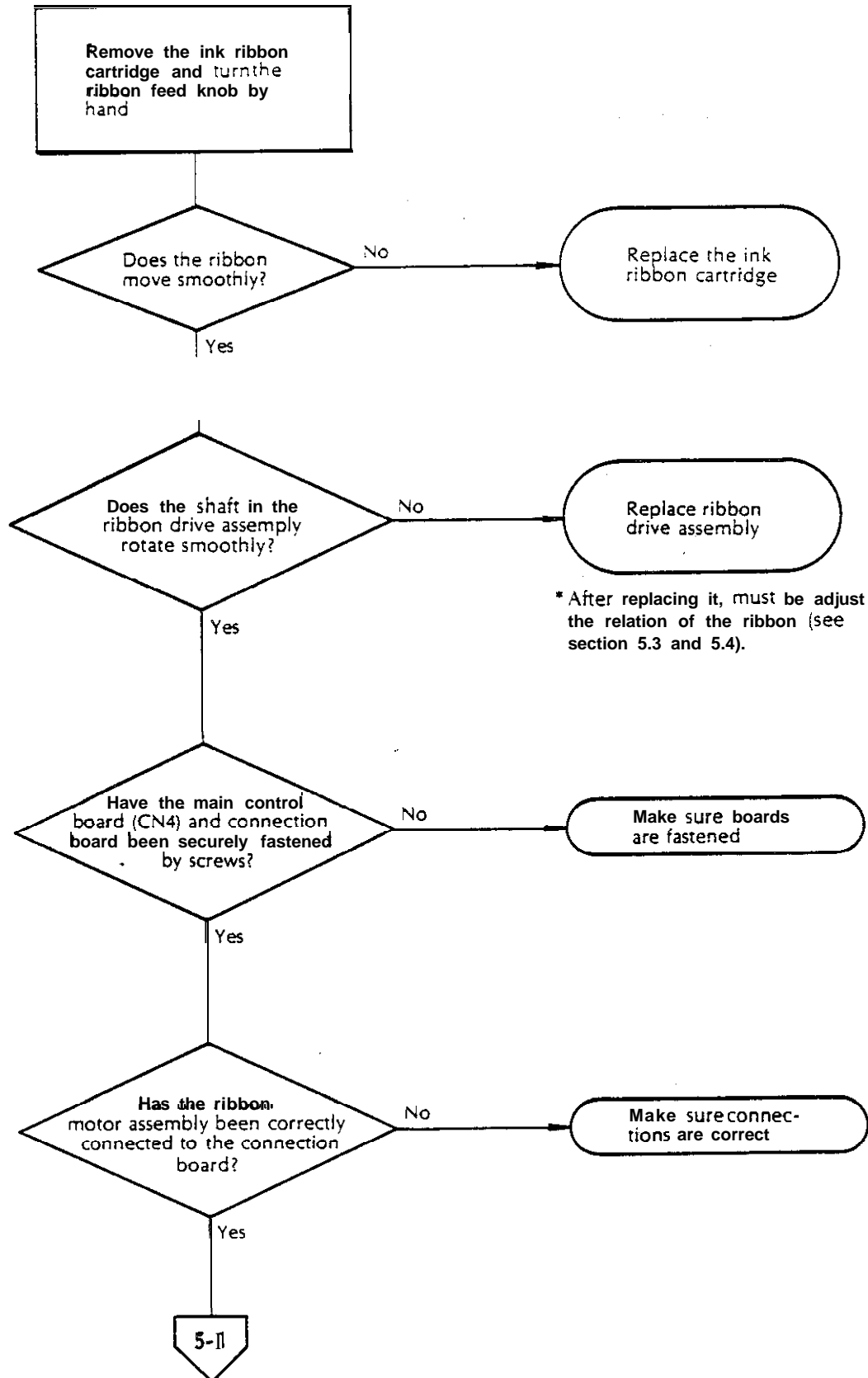
Figure 7-6

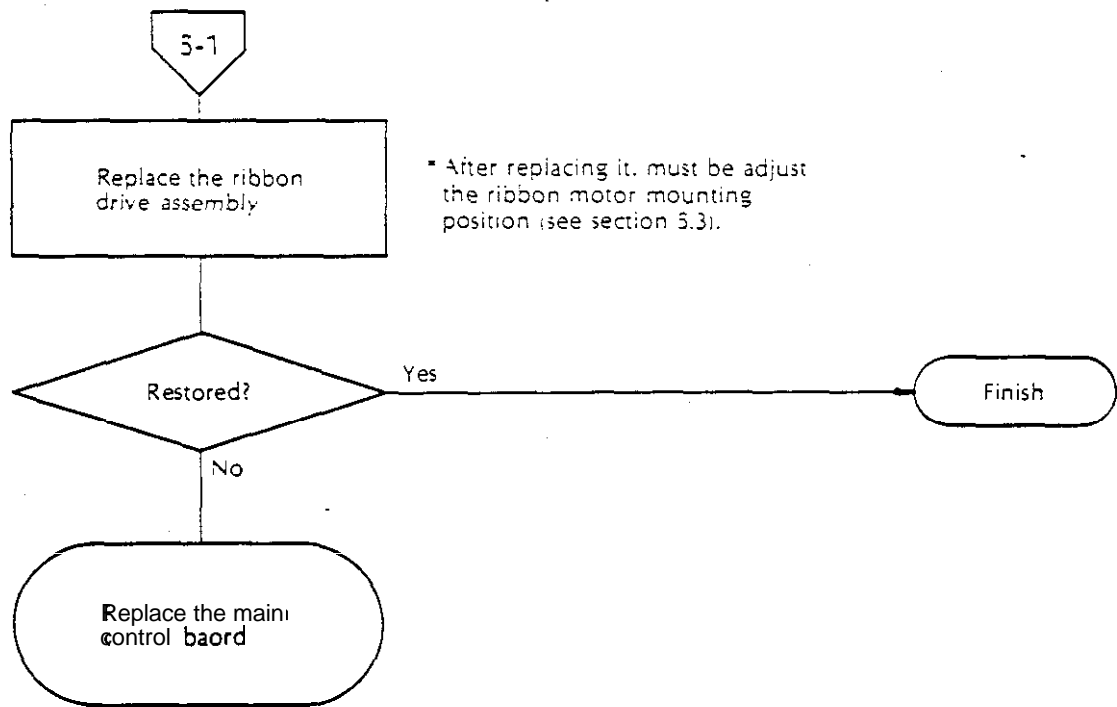


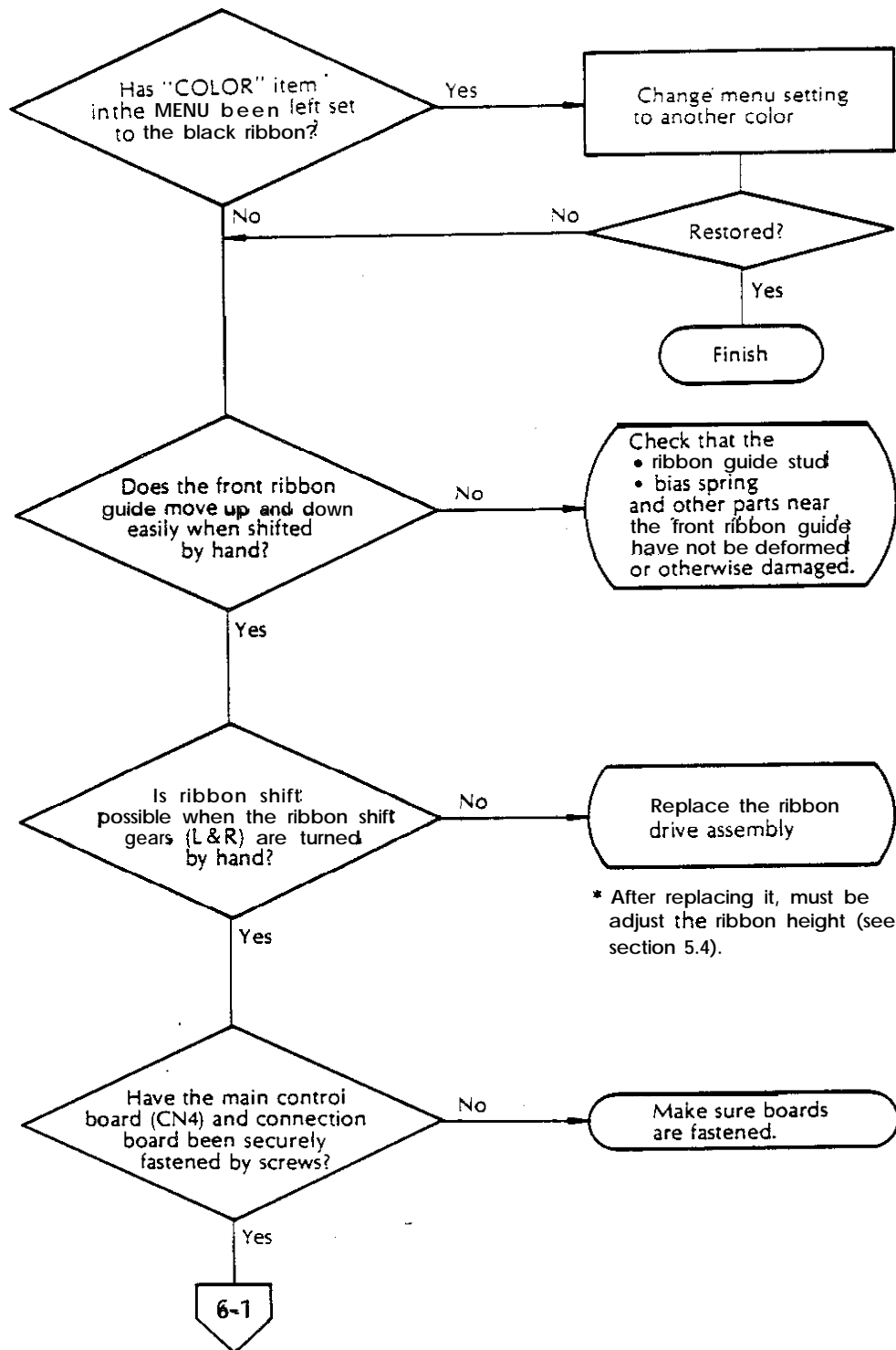


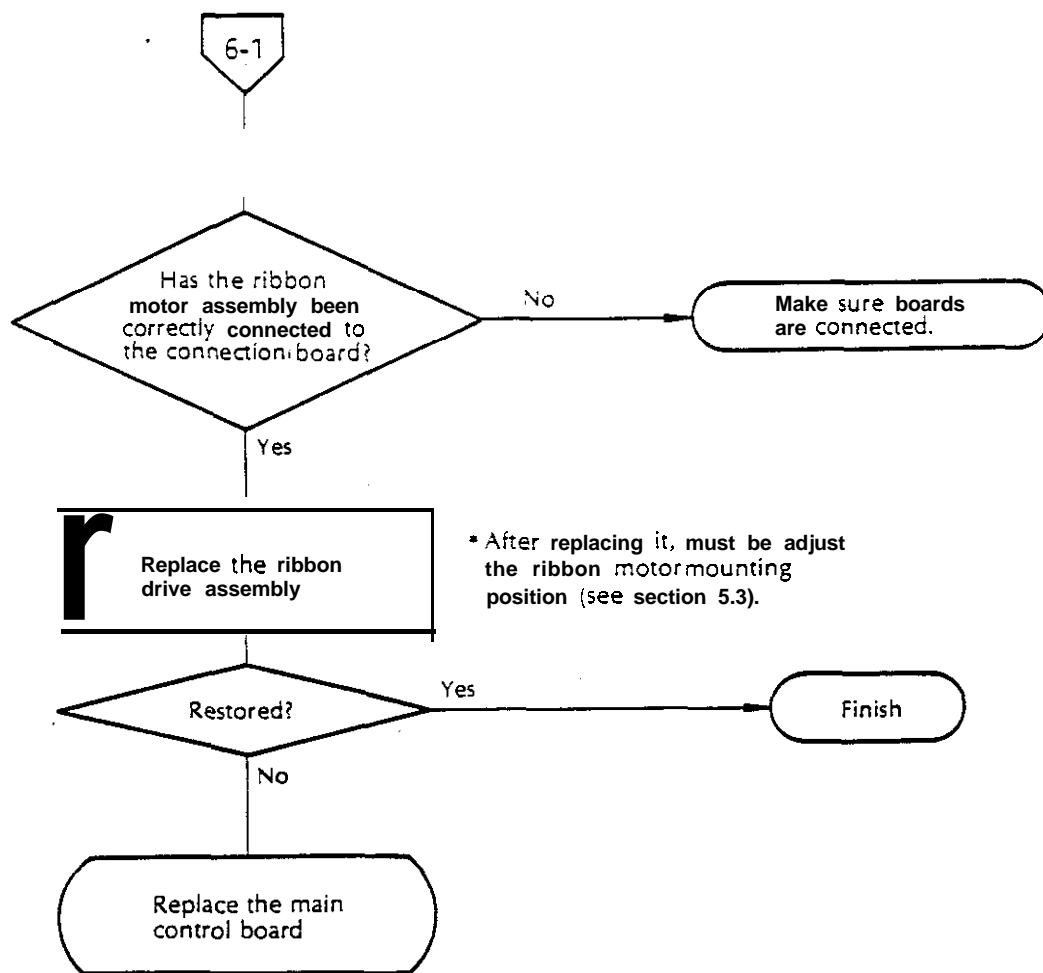
5

Ribbon feed failure



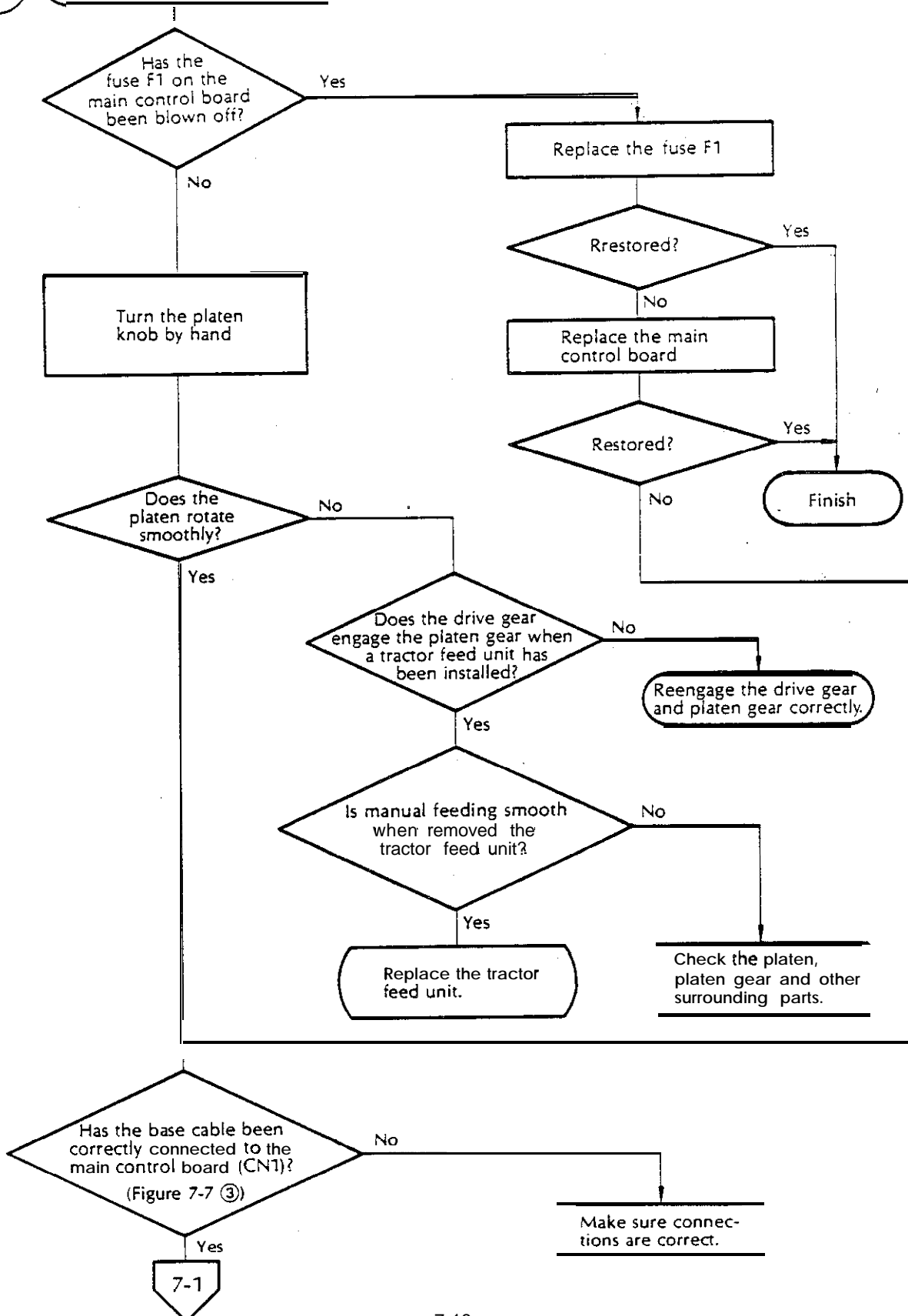






7

Line feed failure



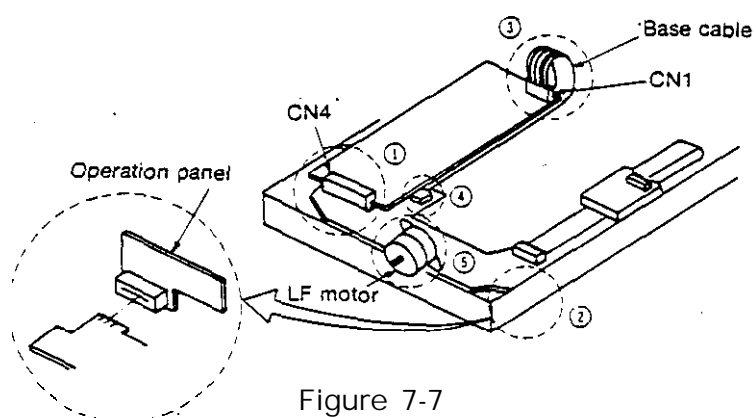
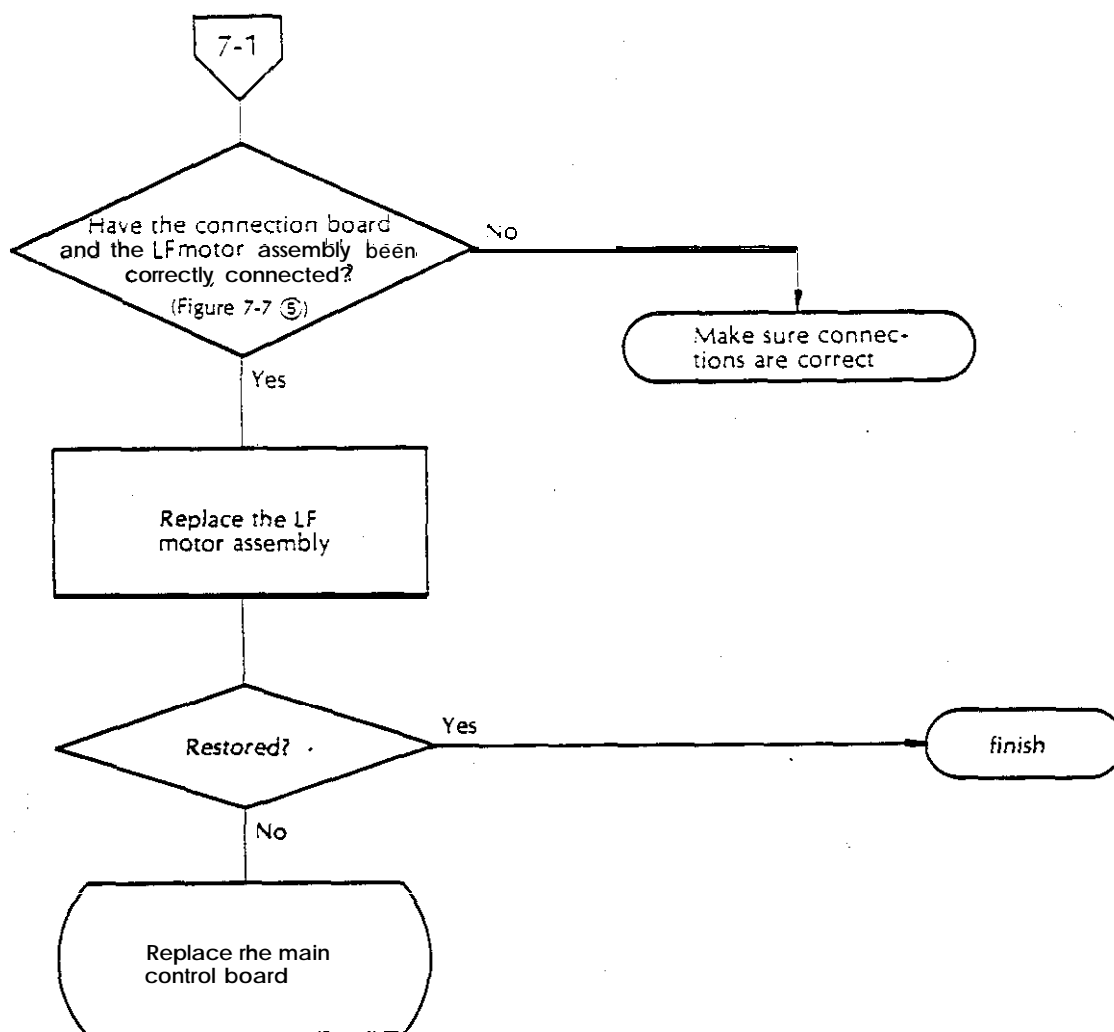


Figure 7-7

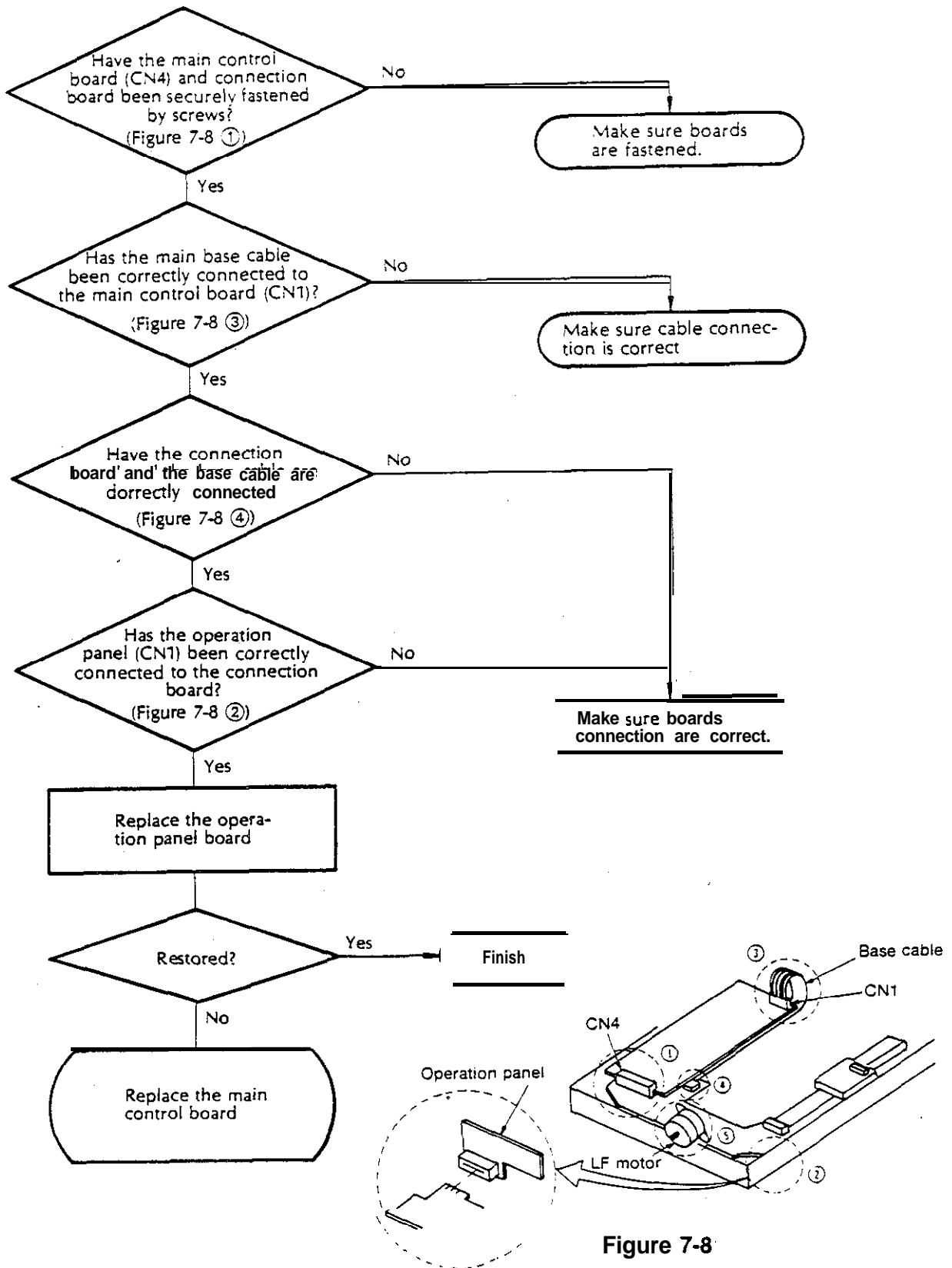
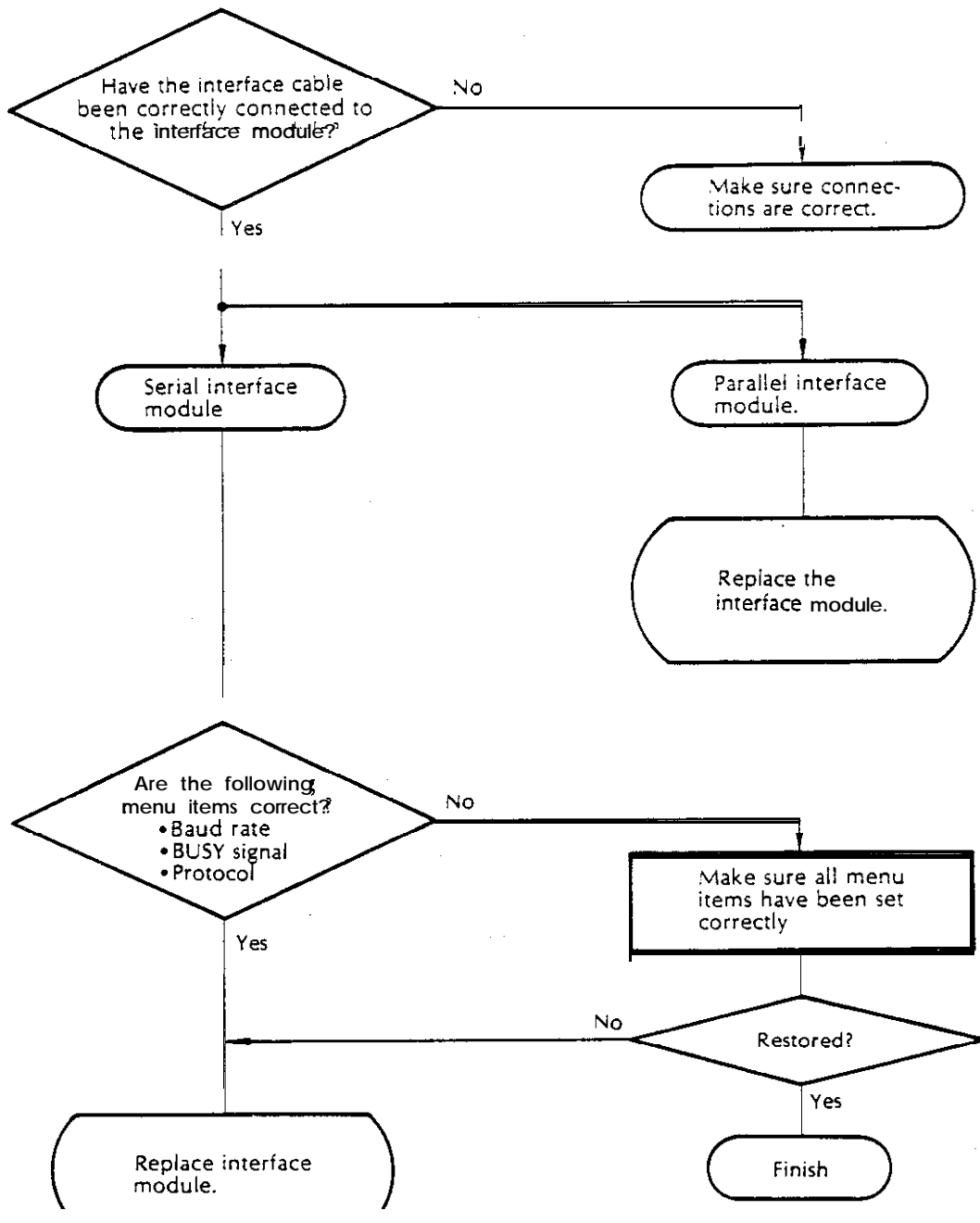


Figure 7-8



8. CIRCUIT SYMBOLS AND CIRCUIT DIAGRAMS

a **CIRCUIT SYMBOLS AND CIRCUIT DIAGRAMS**

Table 8-1 Circuit symbols

Figure 8-1 Circuit diagram of main control board (TBM/MB)(1/8 to 8/8)

Figure 8-2 Circuit diagram of personality module package with Centronics parallel interface (MLCE)

Figure 8-3 Circuit diagram of personality module package with RS-232-C serial interface (MLRC)

Figure 8-4 Circuit diagram of personality module package with RS-422-A serial interface (MLSI)

Figure 8-5(1) Circuit diagram of power supply assembly (120 V)

Figure 8-5(2) Circuit diagram of power supply assembly (120 V)

Figure 8-5(3) Circuit diagram of power supply unit (220 V/240 V)

Figure 8-6 Circuit diagram of RAM board (optional)

Table 8-1 Circuit symbols

Symbol	Code	Description	Symbol	Code	Description
	Q	Inverter (open collector)		SW	Locking-type switch, Non-locking type switch
	Q	Buffer gate with (open collector)		S	Short wire or short plug
	Q	2 AND (open collector)		SP	Jumper plug
	OSC	Ceramic oscillator		CN	Connection (pin)
	TR	Transistor			Indicates that this is a part
	D	Diode		FG	Frame ground
	D	Zener diode		SG	Signal ground
	D	LED		Q	Comparator
		Block diode		HP.1	Thermistor
	TH	Thyristor			
	FLS				
	FET				LED & Photo transistor a. Ribbon Home Position detector, paper end and others b. Encoder
	C	Capacitor		F	Fuse
	C	Electrolytic capacitor			Voltage regulator
	R	Resistor		TF	Transformer
	RM	Module resistance		BAT	Lithium battery
	L	Coil			

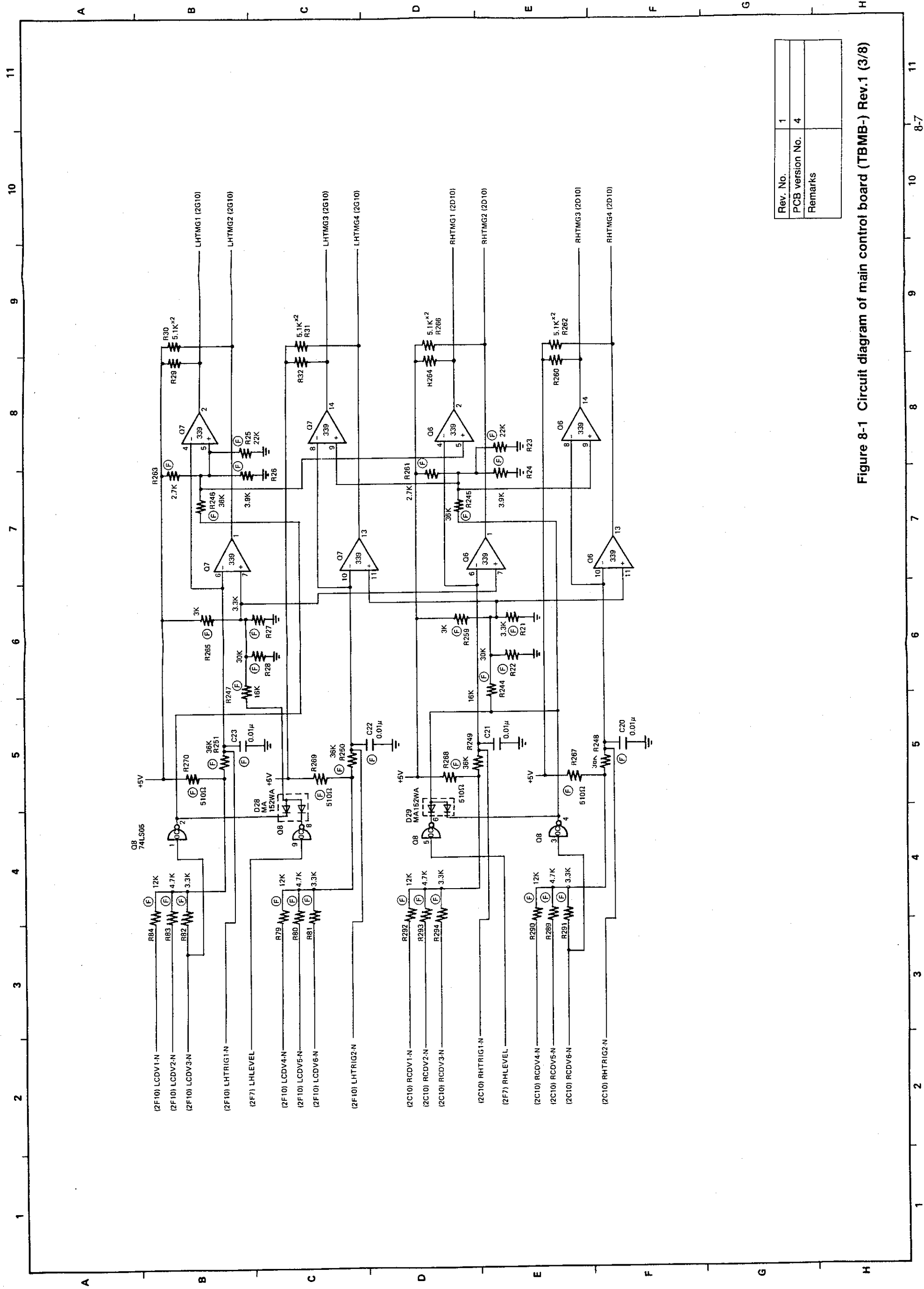
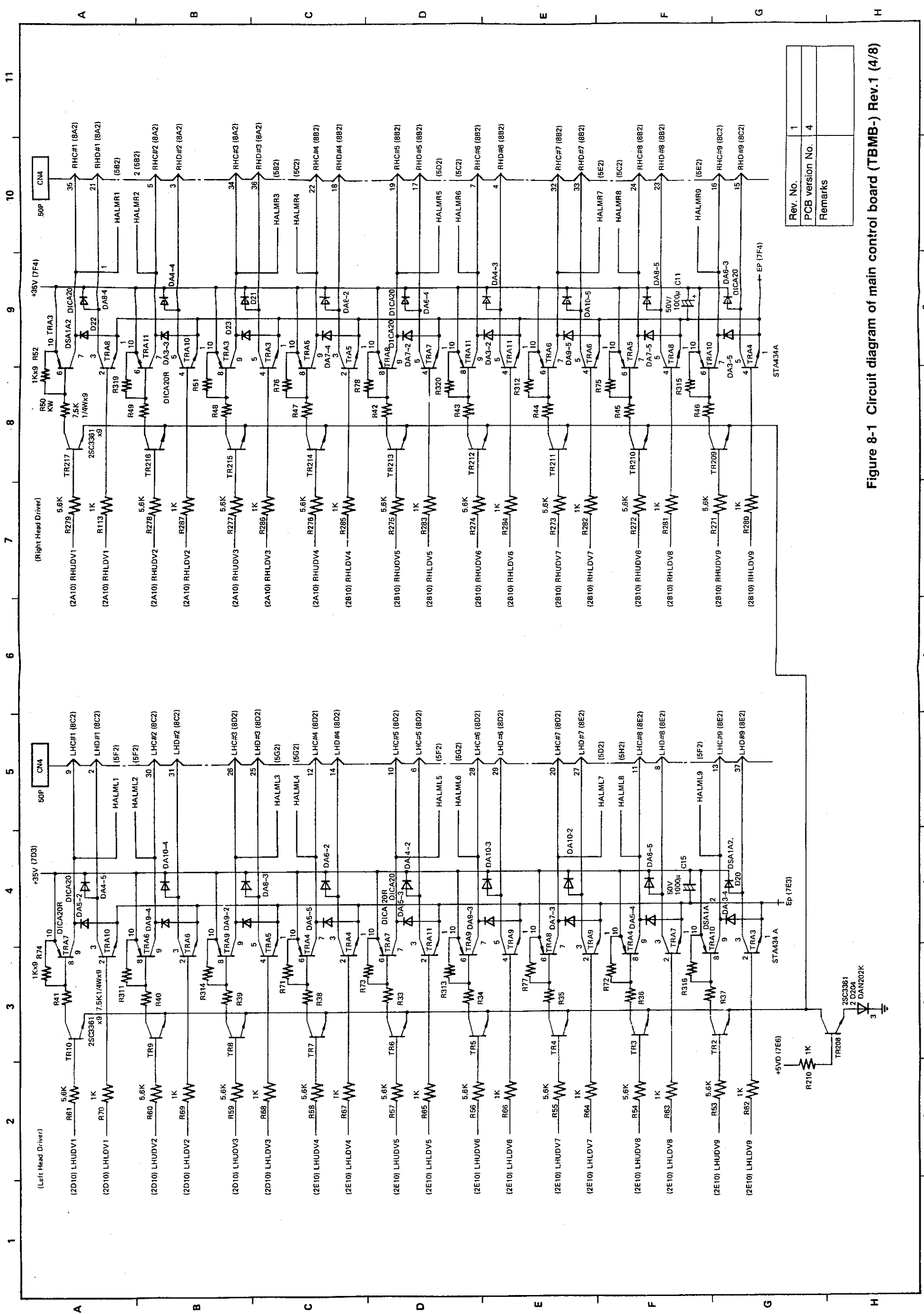


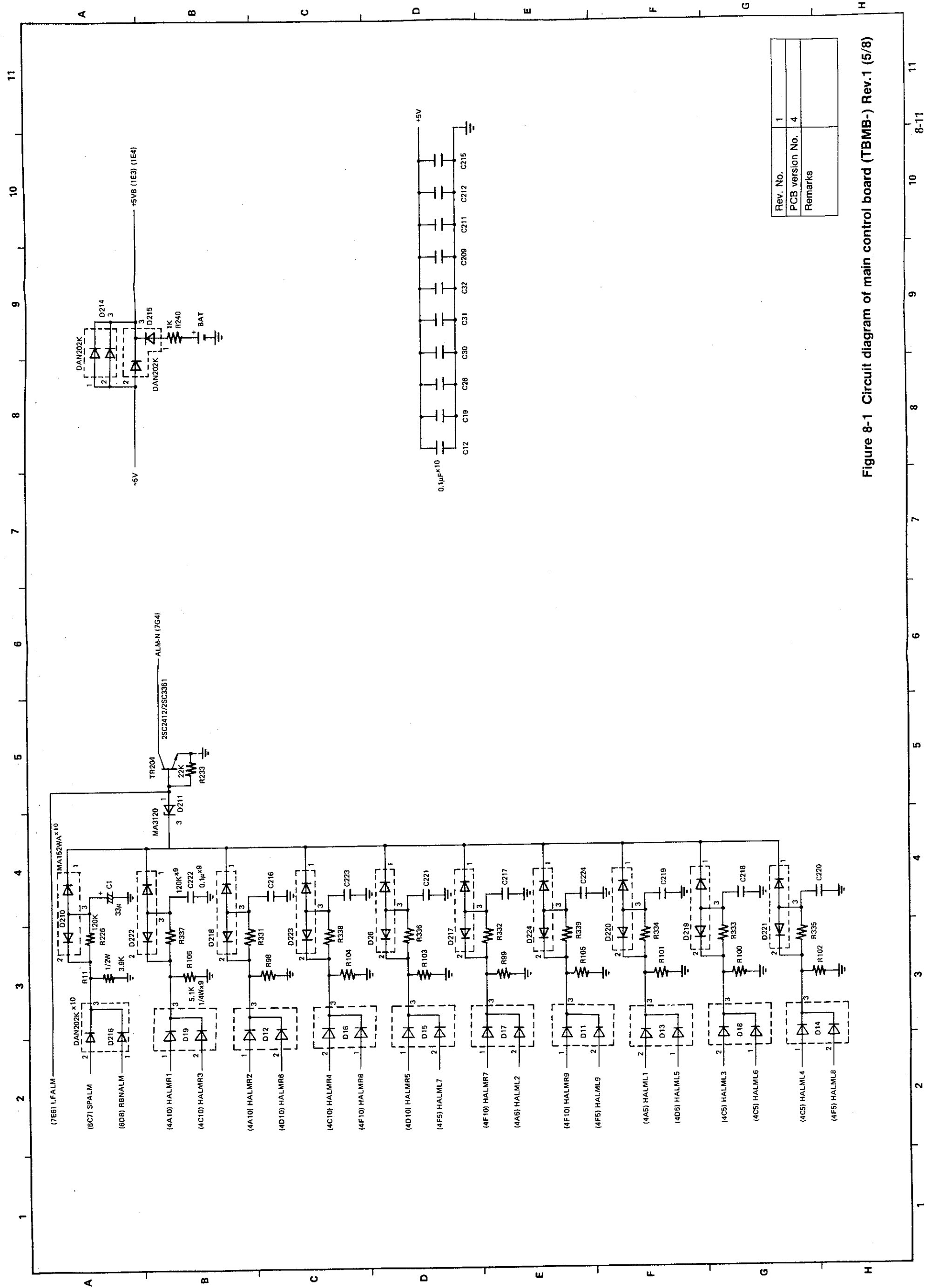
Figure 8-1 Circuit diagram of main control board (TBMB-) Rev.1 (3/8)

Rev. No.	1
PCB version No.	4
Remarks	



Rev. No.	1
PCB version No.	4
Remarks	

Figure 8-1 Circuit diagram of main control board (TBMB-) Rev.1 (4/8)



Rev. No.	1
PCB version No.	4
Remarks	

Figure 8-1 Circuit diagram of main control board (TBM-B-) Rev.1 (5/8)

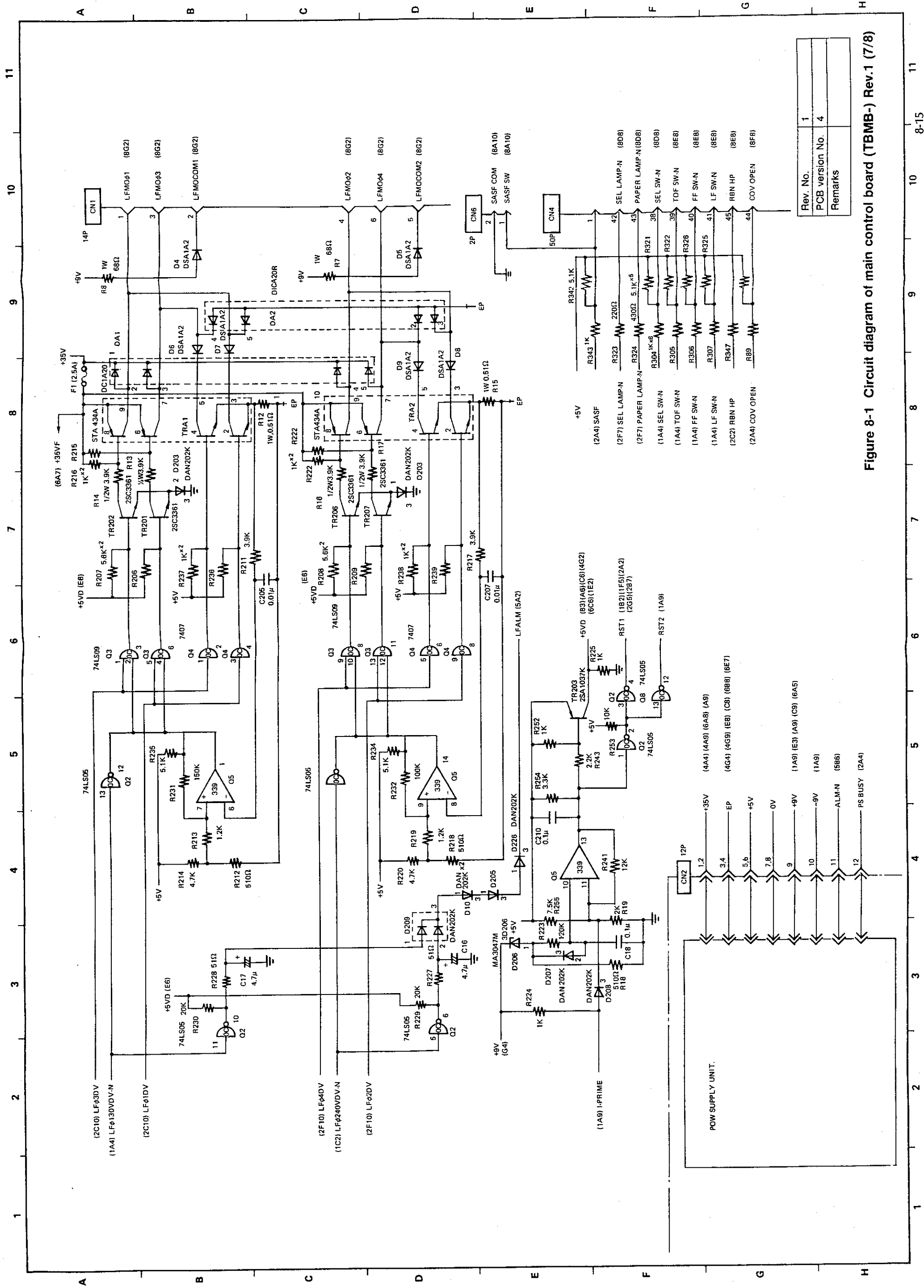
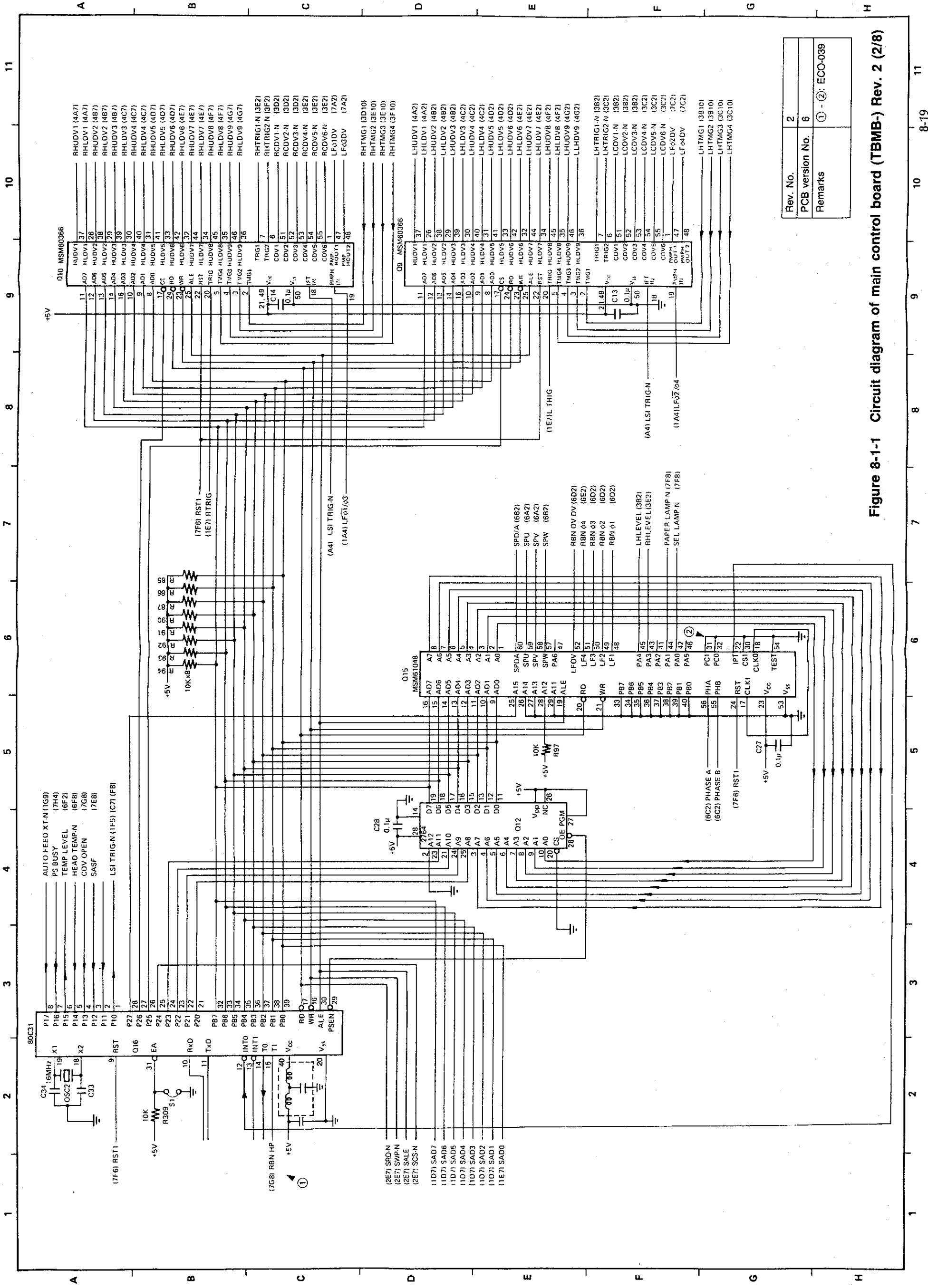


Figure 8-1 Circuit diagram of main control board (TBMB-) Rev.1 (7/8)



Rev. No.	2
PCB version No.	6
Remarks	① - ②: ECO-039

Figure 8-1-1 Circuit diagram of main control board (TBMB-) Rev. 2 (2/8)

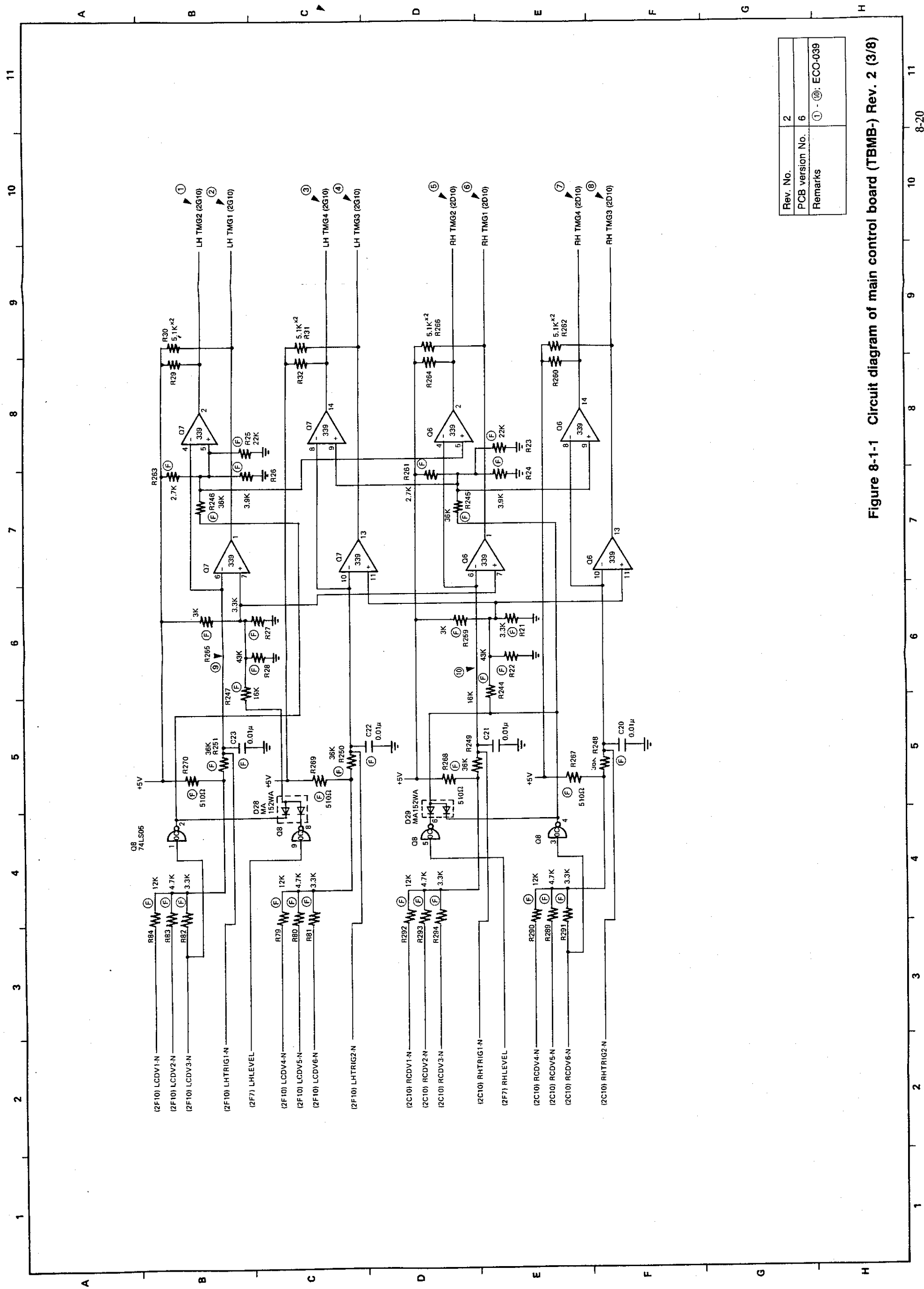


Figure 8-1-1 Circuit diagram of main control board (TBMB-) Rev. 2 (3/8)

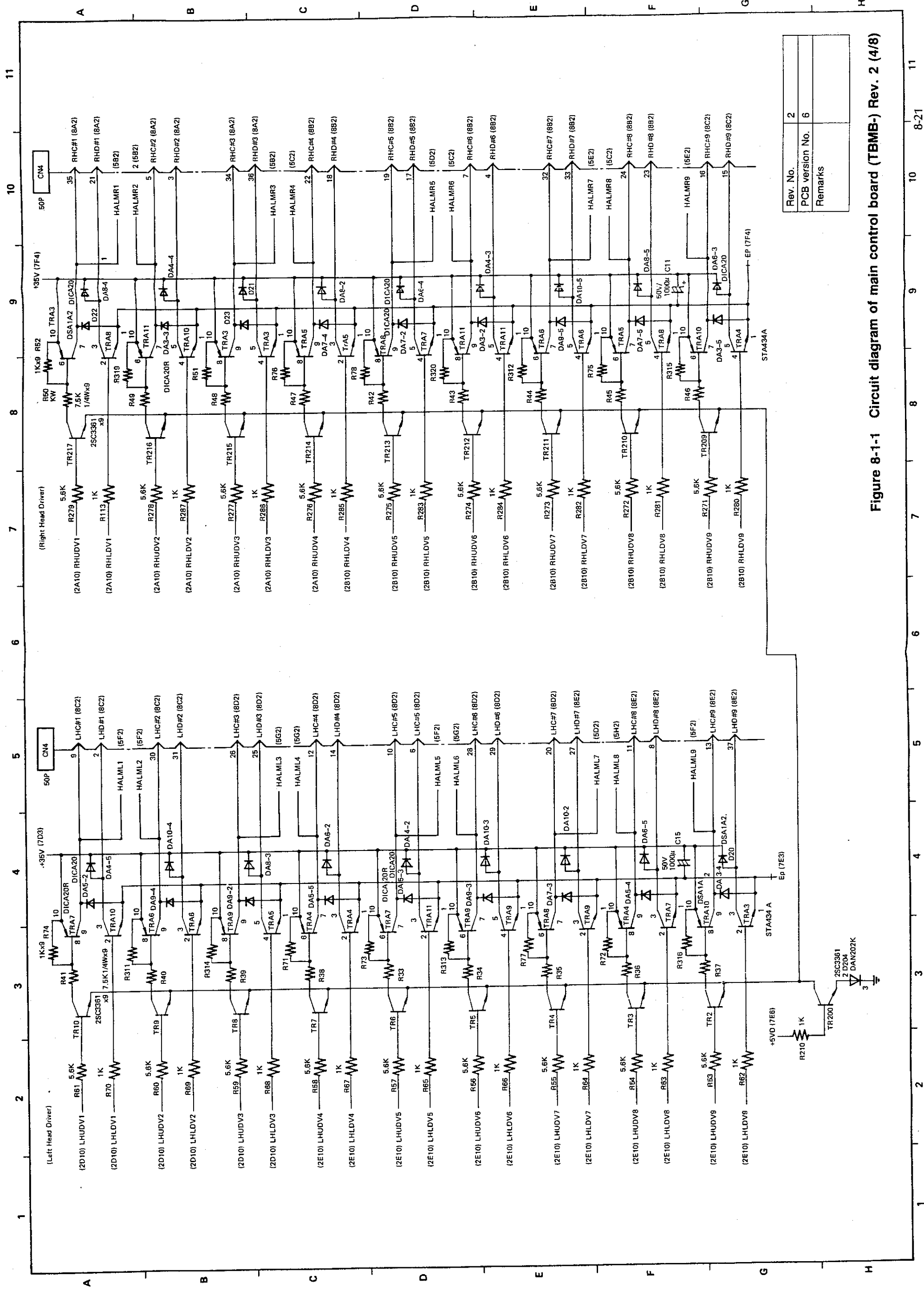
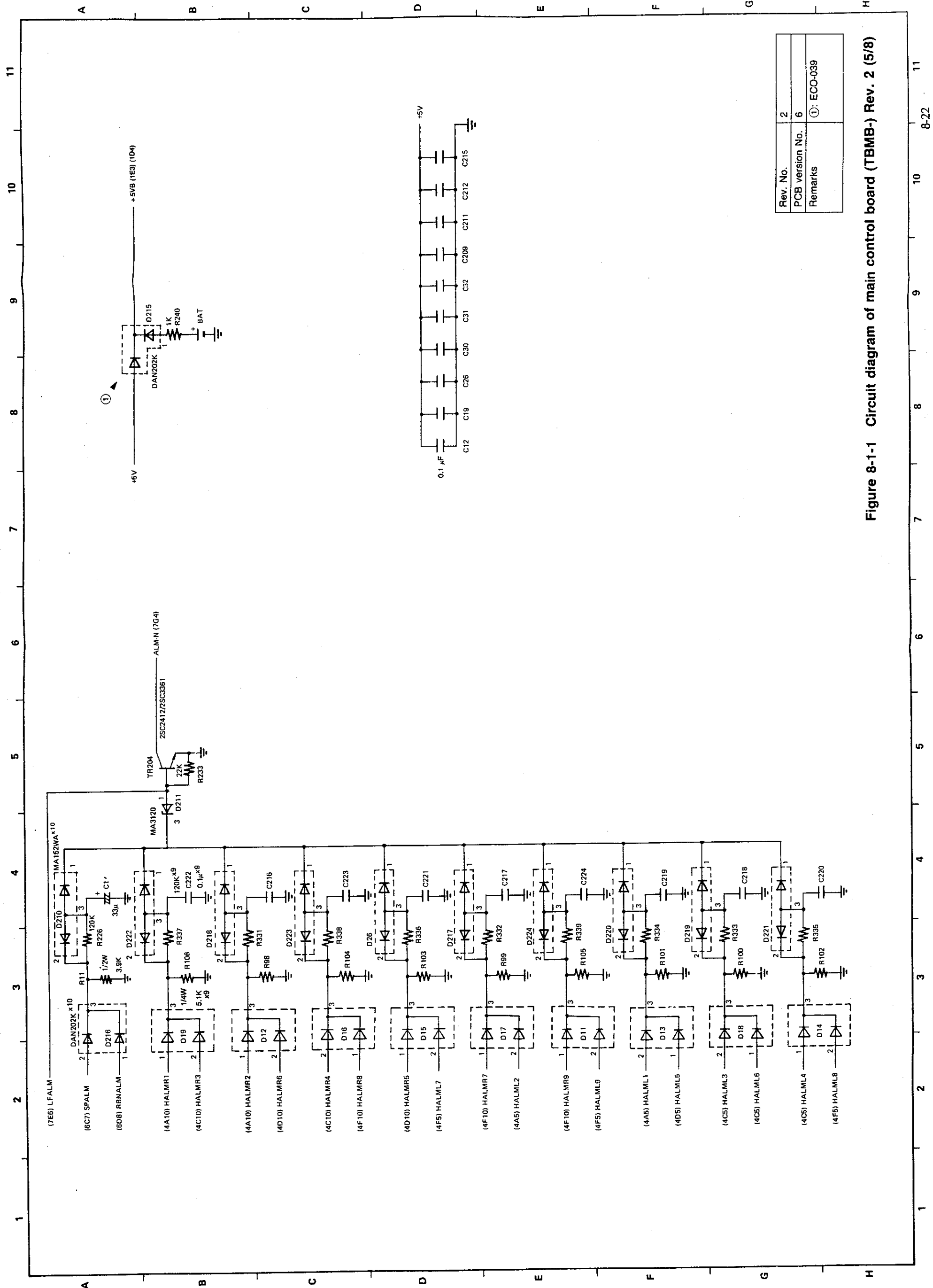
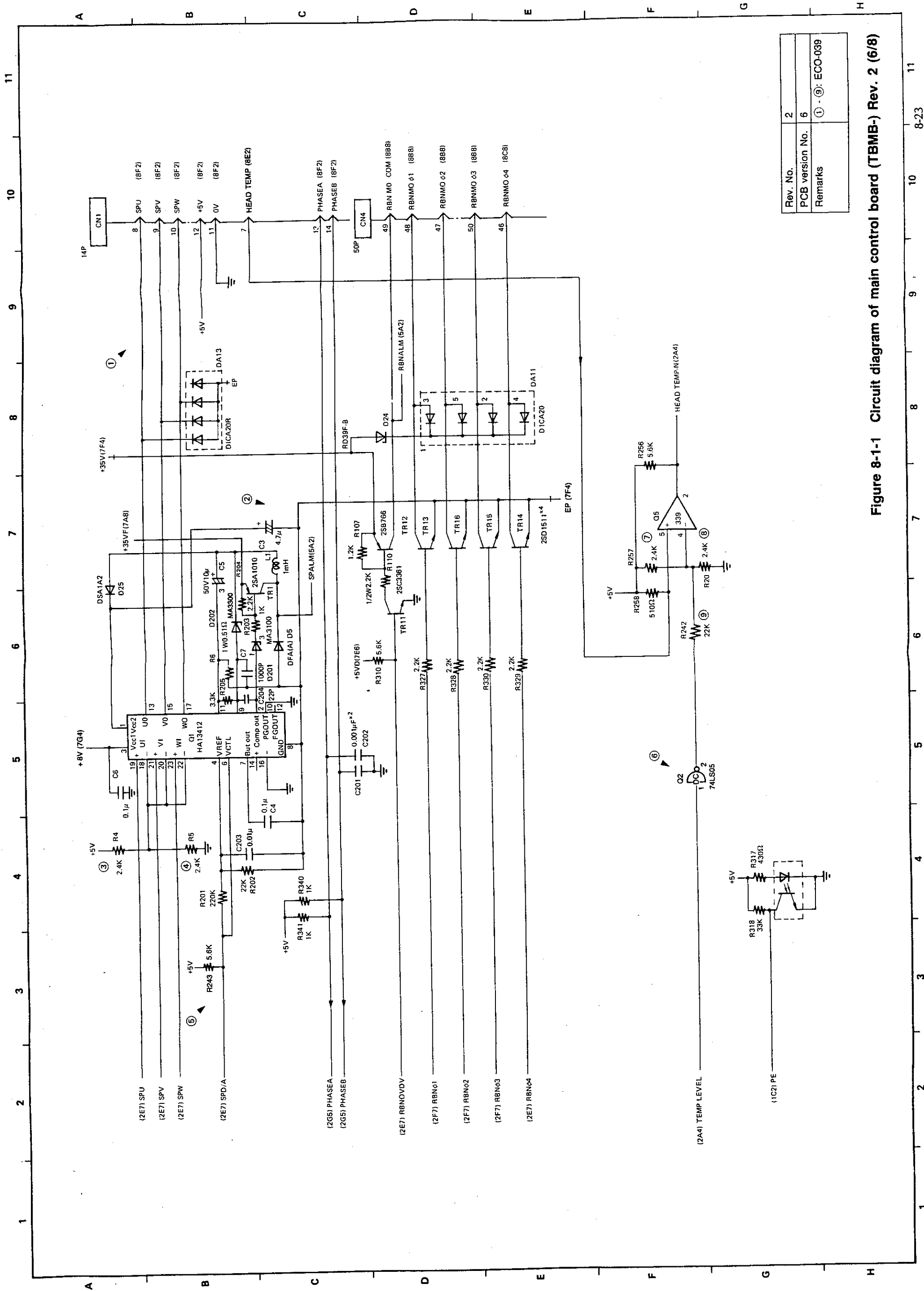


Figure 8-1-1 Circuit diagram of main control board (TBMB-) Rev. 2 (4/8)



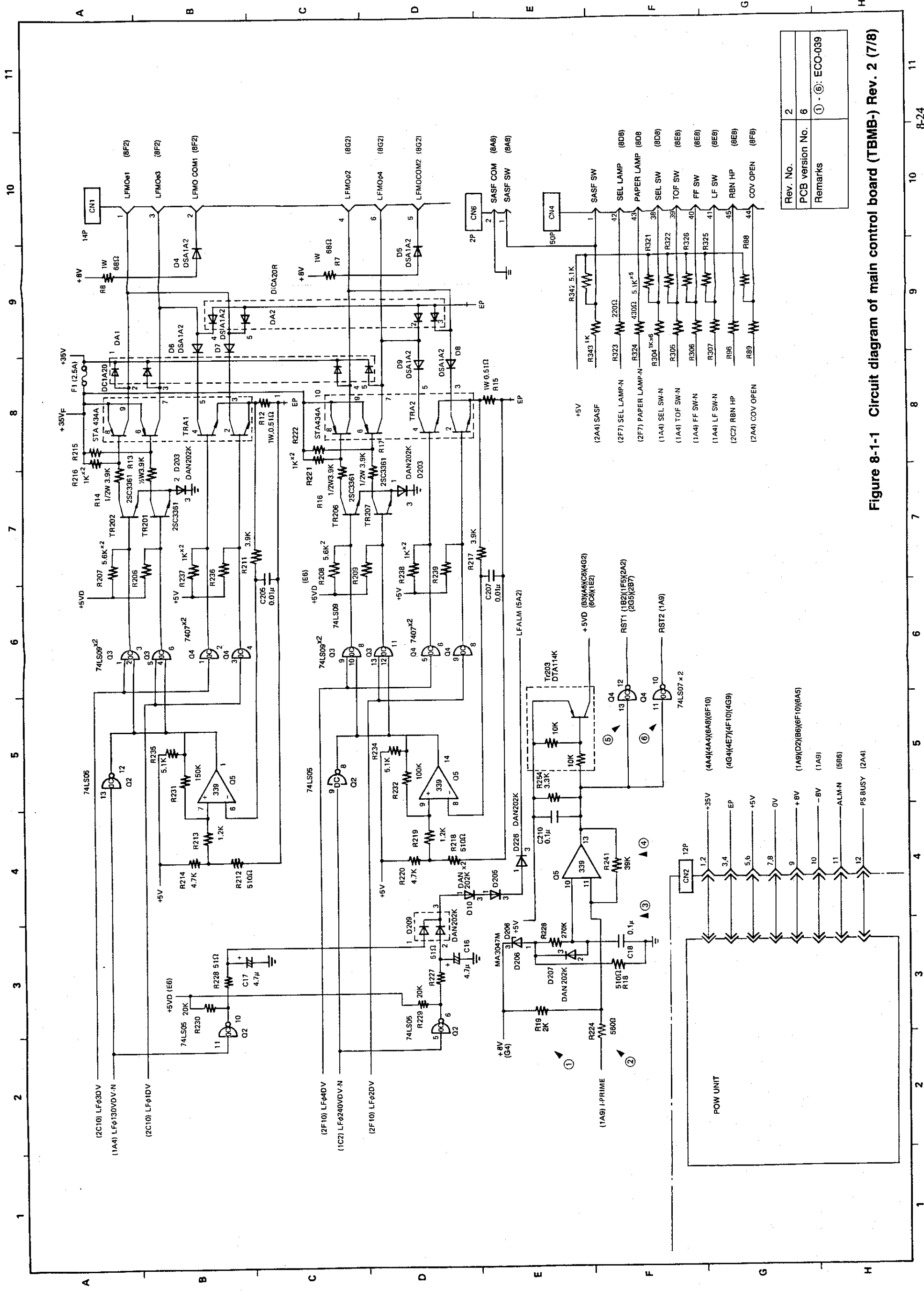
Rev. No.	2
PCB version No.	6
Remarks	①: ECO-039

Figure 8-1-1 Circuit diagram of main control board (TBMB-) Rev. 2 (5/8)



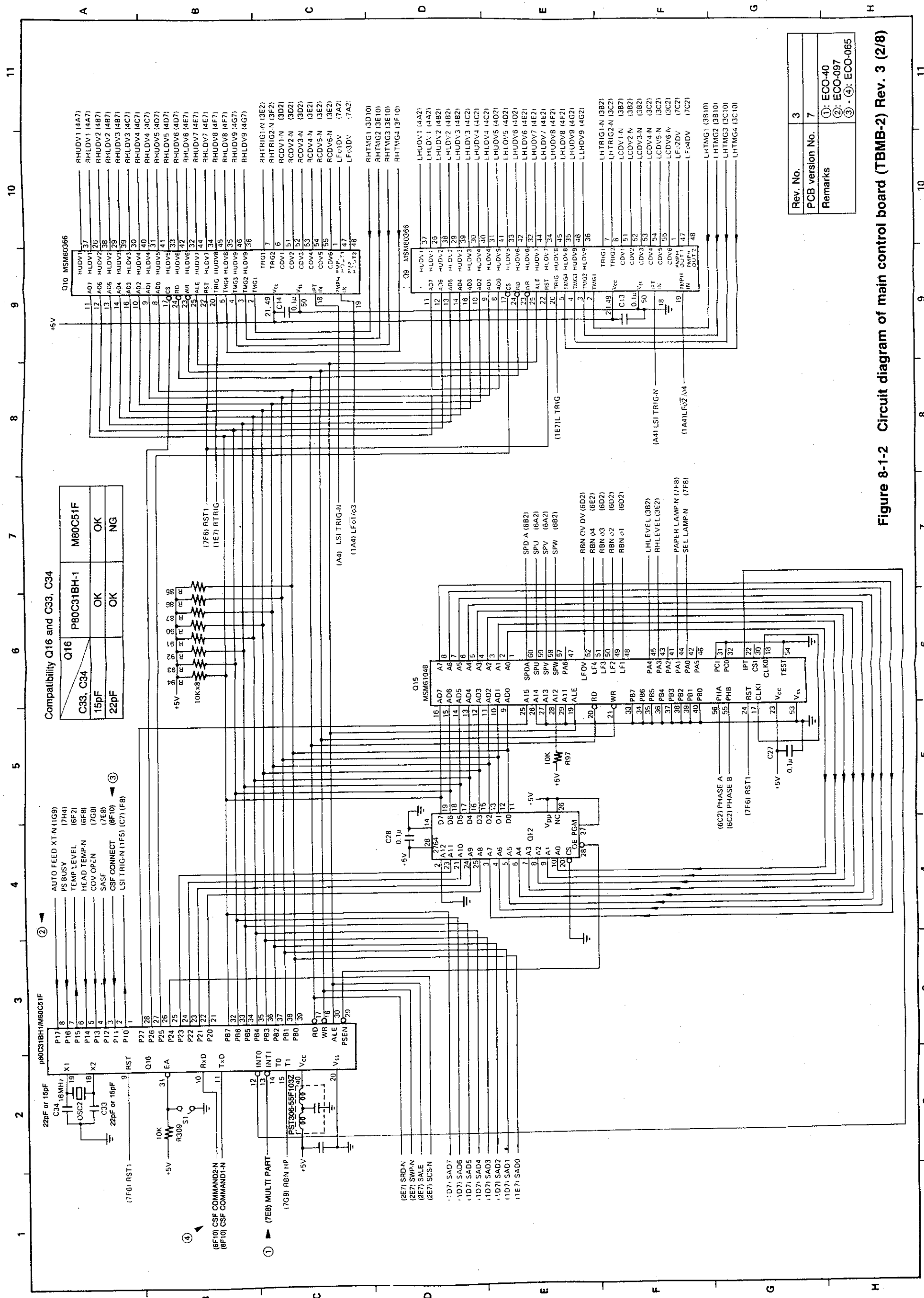
Rev. No.	2
PCB version No.	6
Remarks	① - ⑨: ECO-039

Figure 8-1-1 Circuit diagram of main control board (TBMB-) Rev. 2 (6/8)



Rev. No.	2
PCB version No.	6
Remarks	① - ⑥: ECO-039

Figure 8-1-1 Circuit diagram of main control board (TBMB-) Rev. 2 (7/8)



Compatibility Q16 and C33, C34

Q16	C33, C34	M80C51F
15pF	OK	OK
22pF	OK	NG

Rev. No.	3
PCB version No.	7
Remarks	①: ECO-40 ②: ECO-097 ③: ECO-085

Figure 8-1-2 Circuit diagram of main control board (TBMB-2) Rev. 3 (2/8)

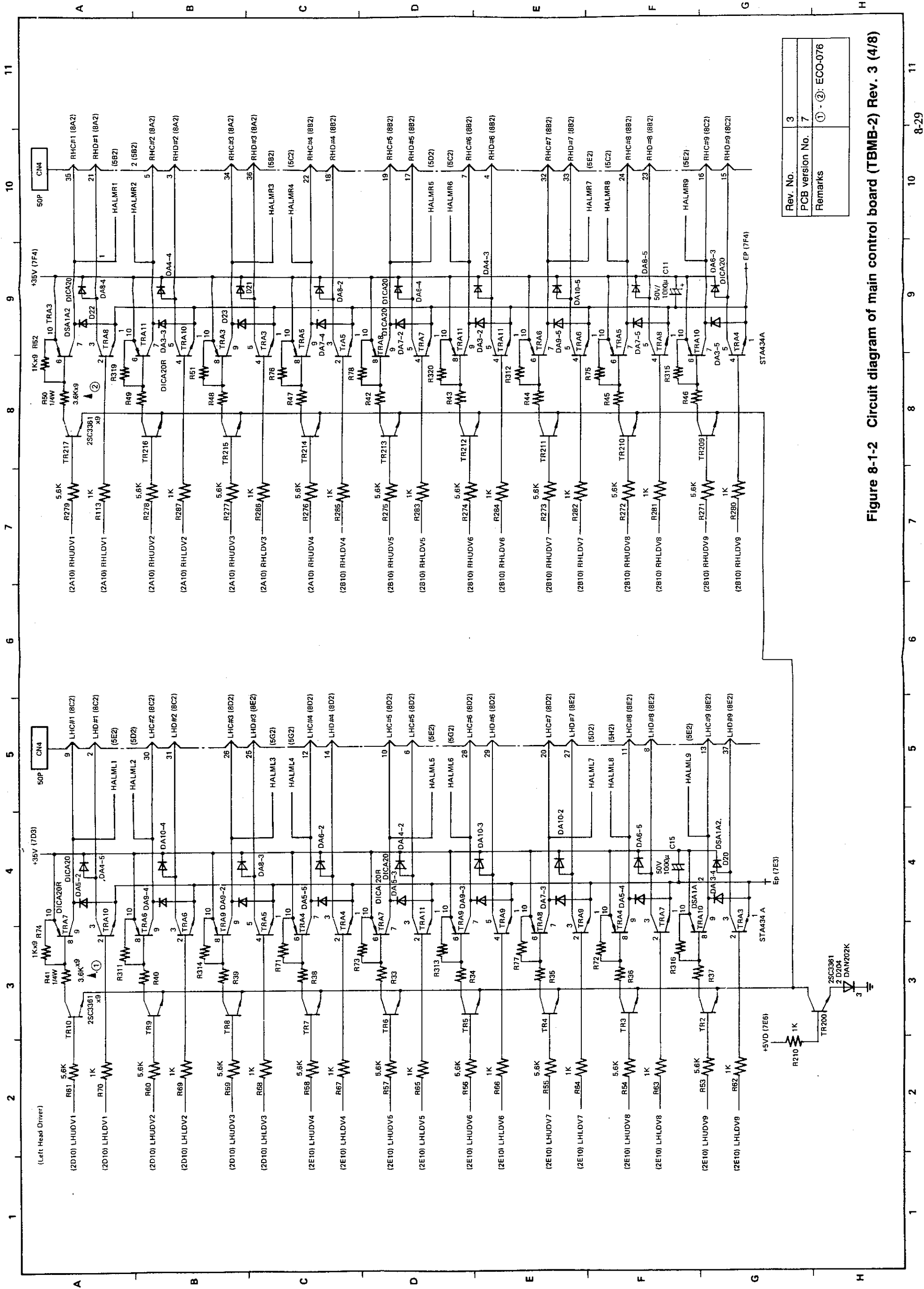
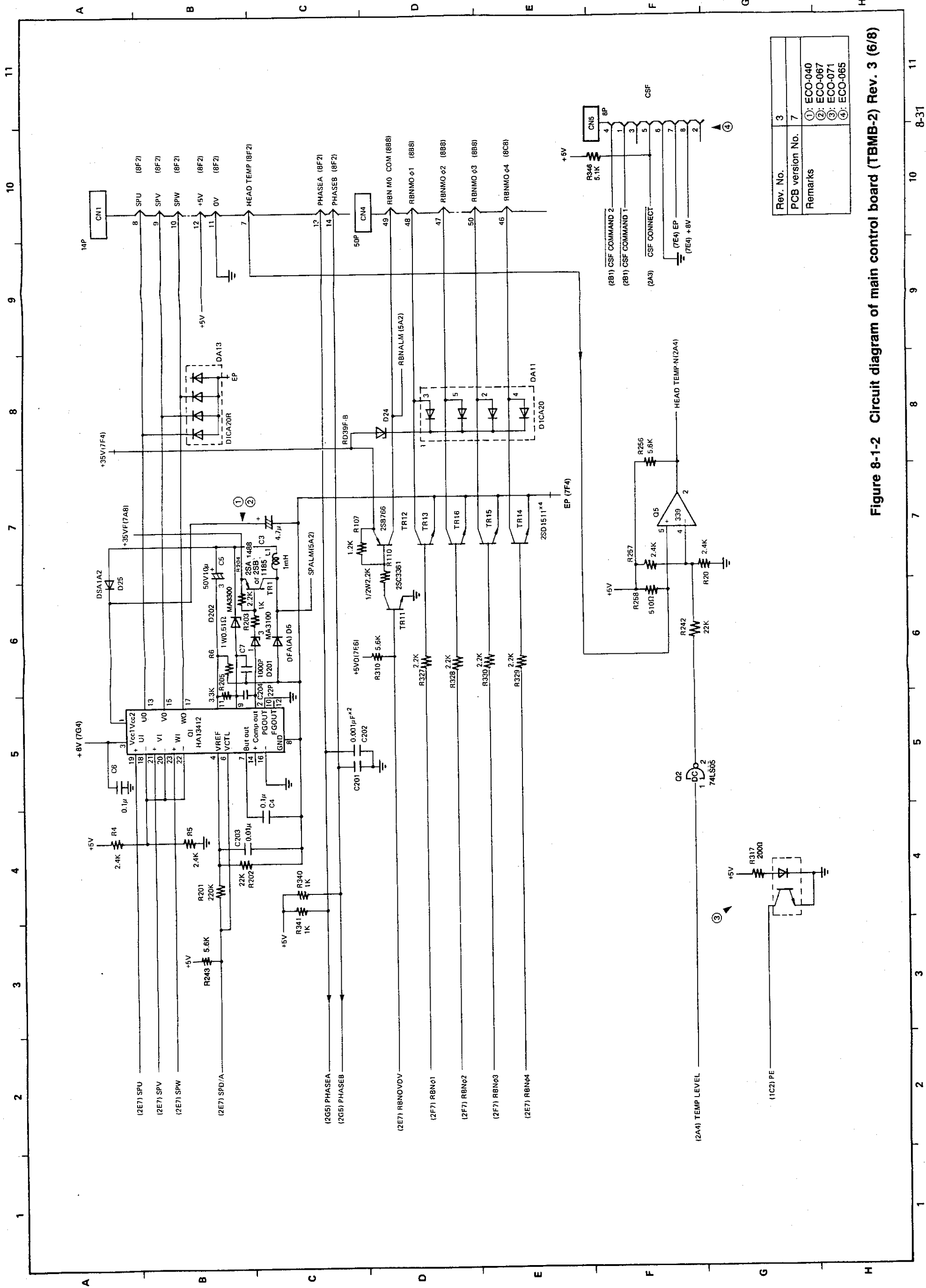


Figure 8-1-2 Circuit diagram of main control board (TBMB-2) Rev. 3 (4/8)



Rev. No.	3
PCB version No.	7
Remarks	①: ECO-040 ②: ECO-067 ③: ECO-071 ④: ECO-065

Figure 8-1-2 Circuit diagram of main control board (TBMB-2) Rev. 3 (6/8)

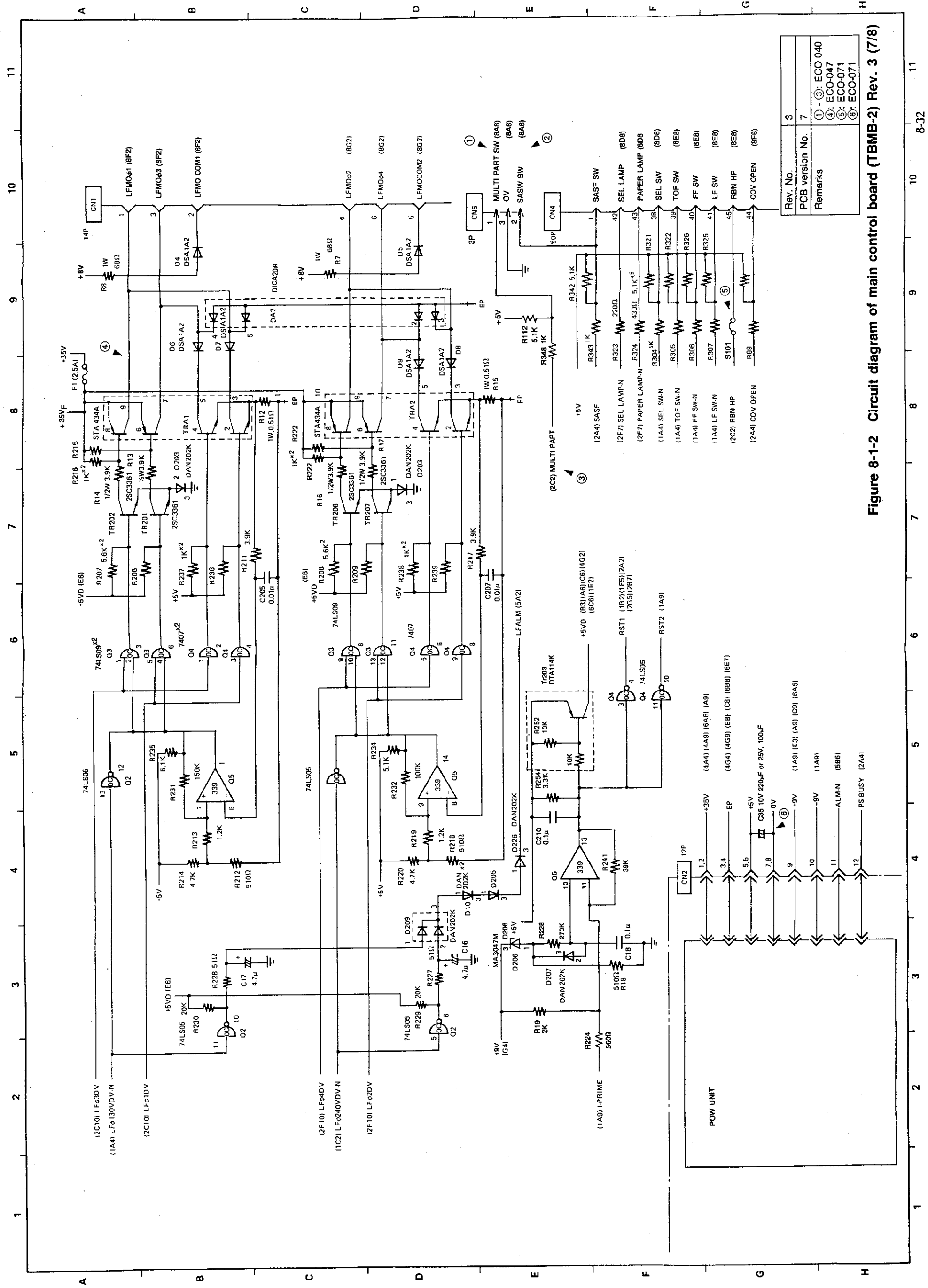


Figure 8-1-2 Circuit diagram of main control board (TBMB-2) Rev. 3 (7/8)

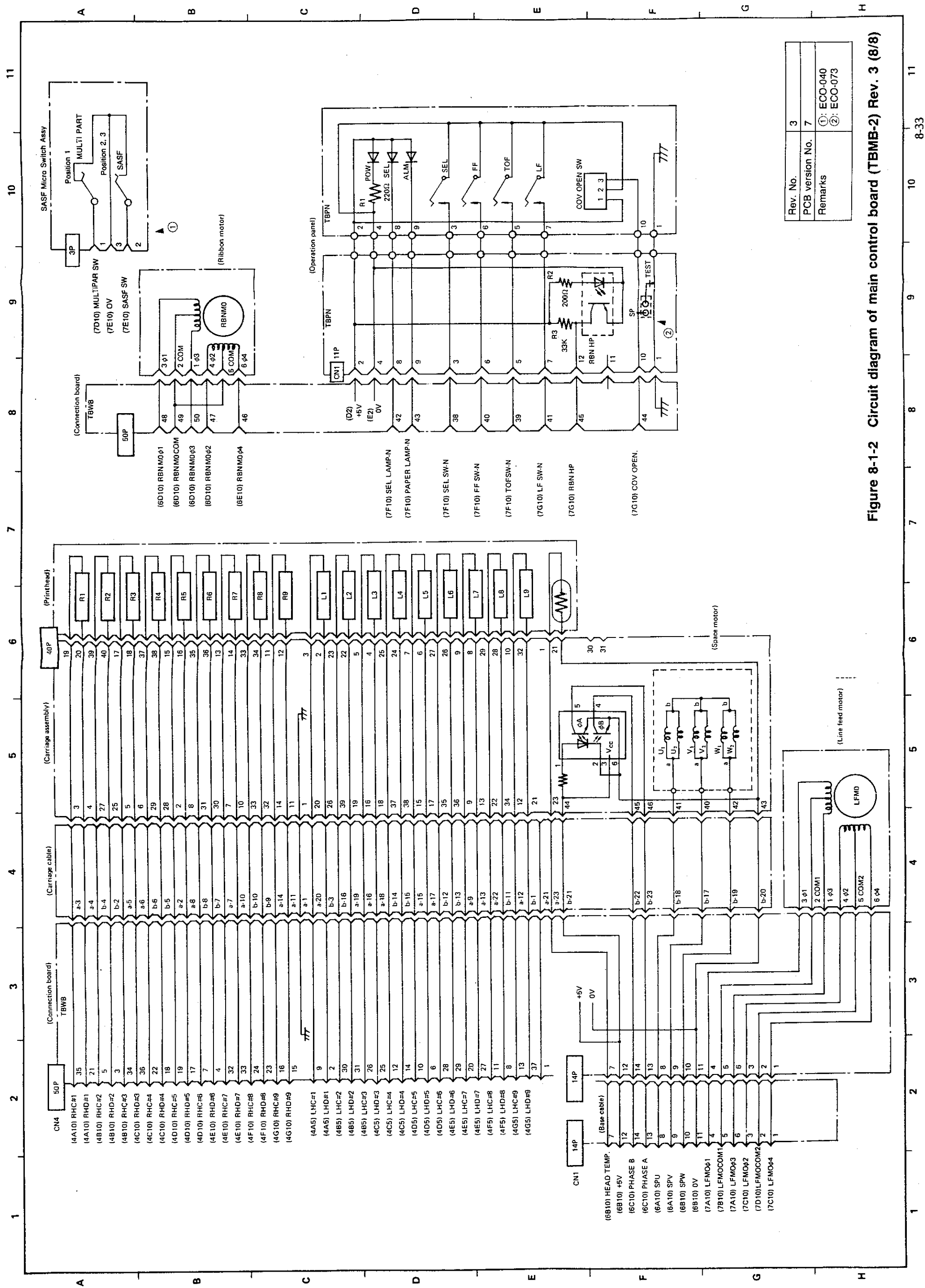
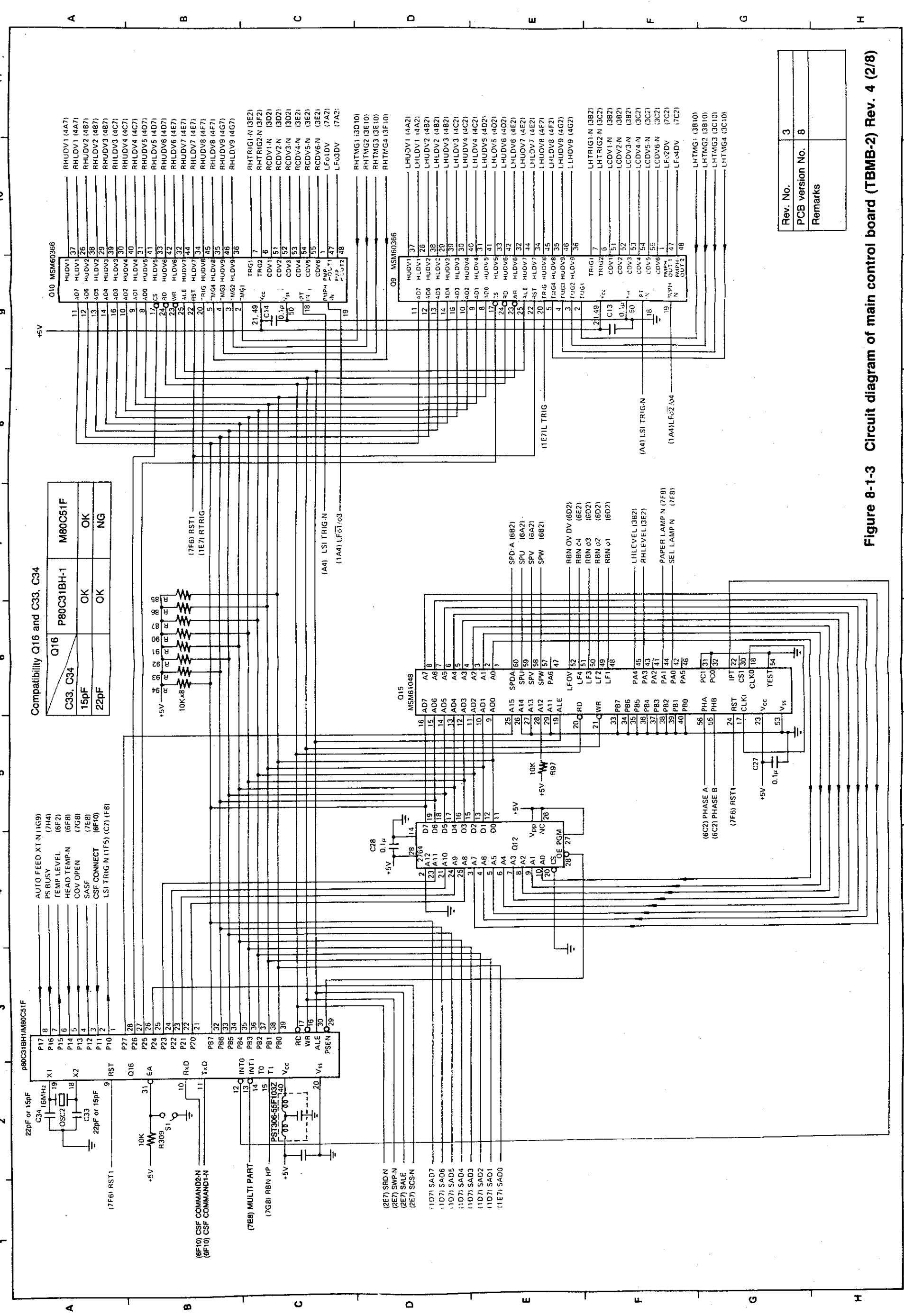


Figure 8-1-2 Circuit diagram of main control board (TBMB-2) Rev. 3 (8/8)

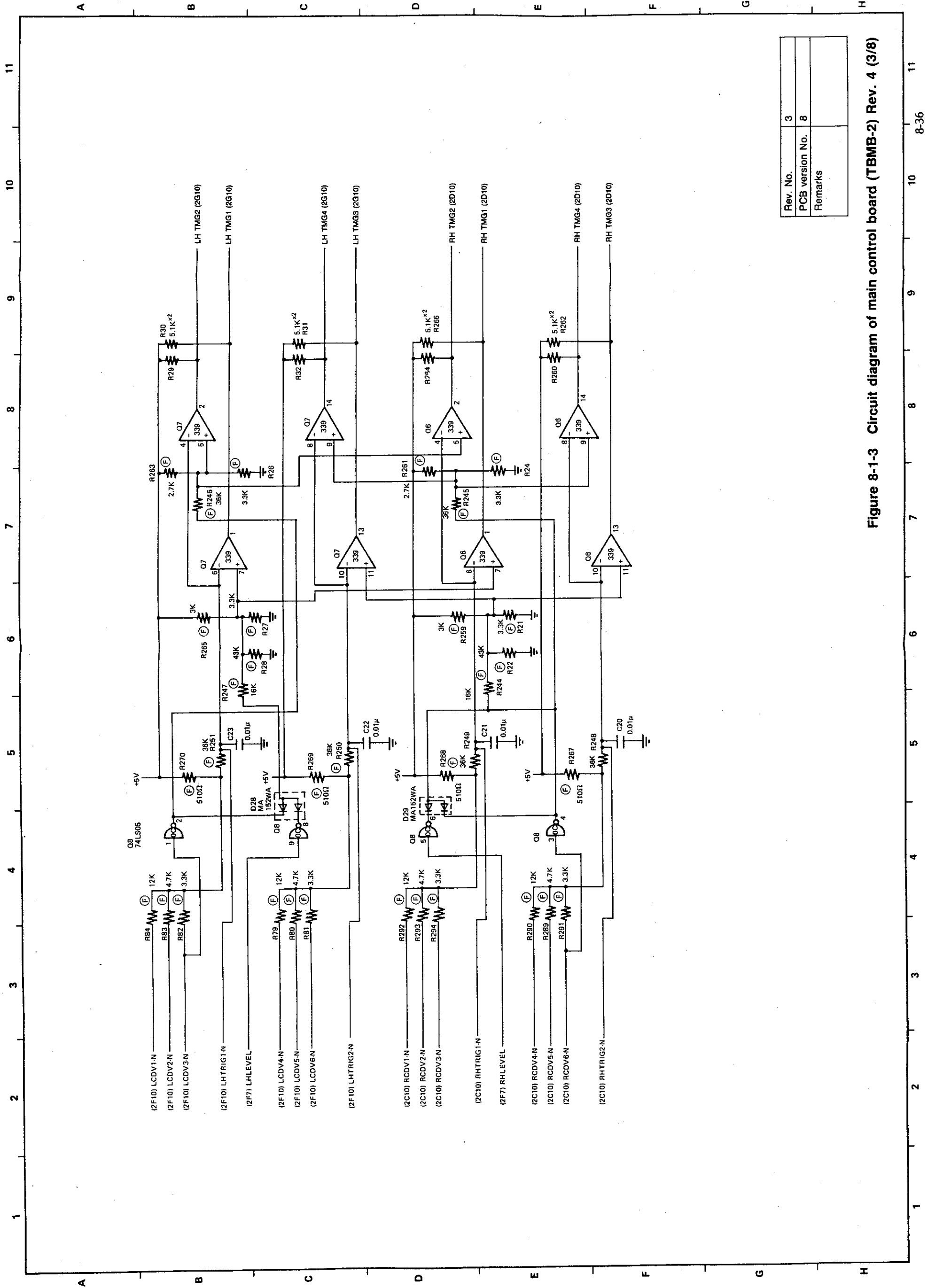


Compatibility Q16 and C33, C34

Q16	P80C31BH-1	M80C51F
C33, C34	15pF	22pF
	OK	OK
	OK	NG

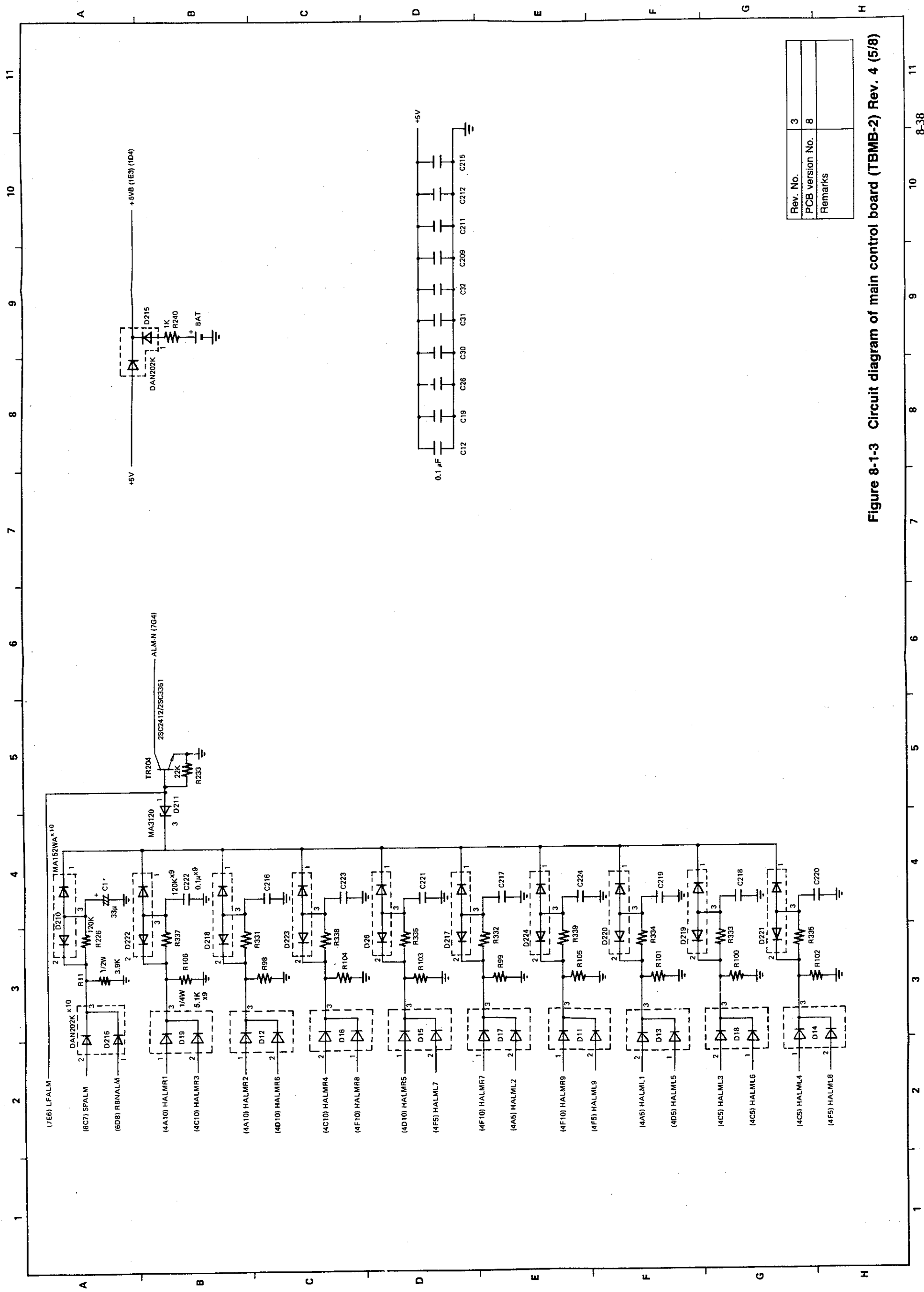
Rev. No.	3
PCB version No.	8
Remarks	

Figure 8-1-3 Circuit diagram of main control board (TBMB-2) Rev. 4 (2/8)



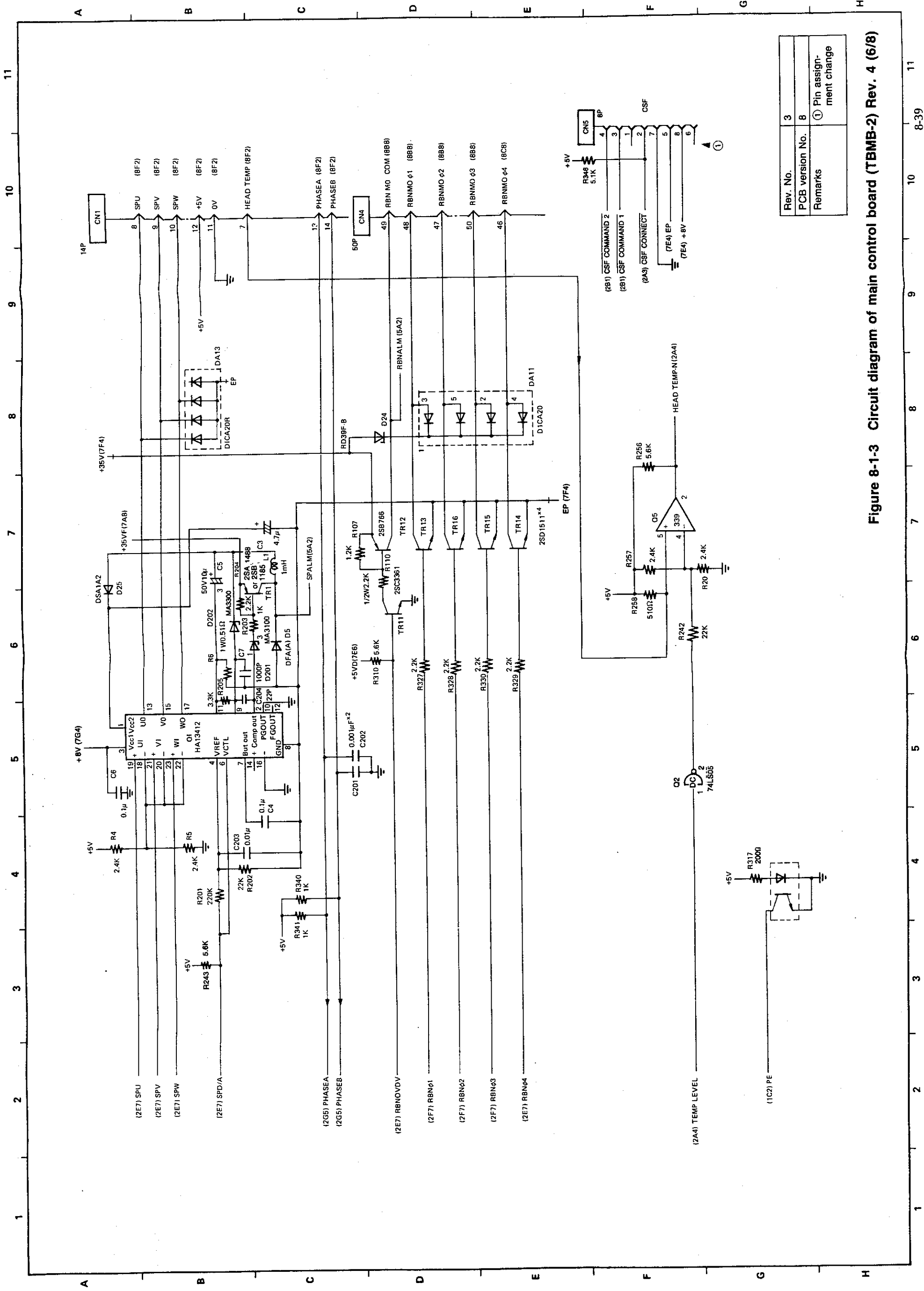
Rev. No.	3
PCB version No.	8
Remarks	

Figure 8-1-3 Circuit diagram of main control board (TBMB-2) Rev. 4 (3/8)



Rev. No.	3
PCB version No.	8
Remarks	

Figure 8-1-3 Circuit diagram of main control board (TBMB-2) Rev. 4 (5/8)



Rev. No.	3
PCB version No.	8
Remarks	① Pin assignment change

Figure 8-1-3 Circuit diagram of main control board (TBMB-2) Rev. 4 (6/8)

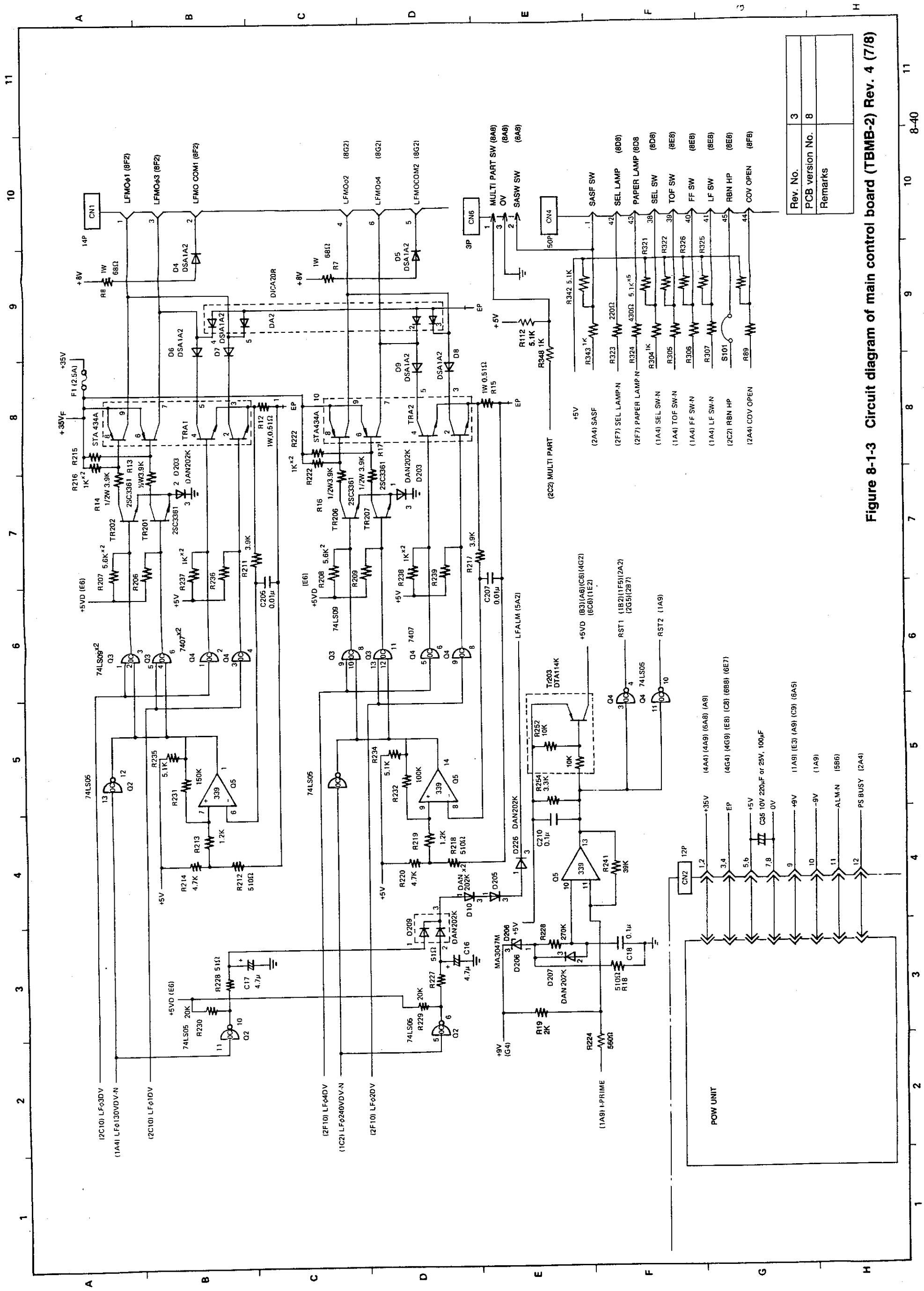


Figure 8-1-3 Circuit diagram of main control board (TBMB-2) Rev. 4 (7/8)

Rev. No.	3
PCB version No.	8
Remarks	

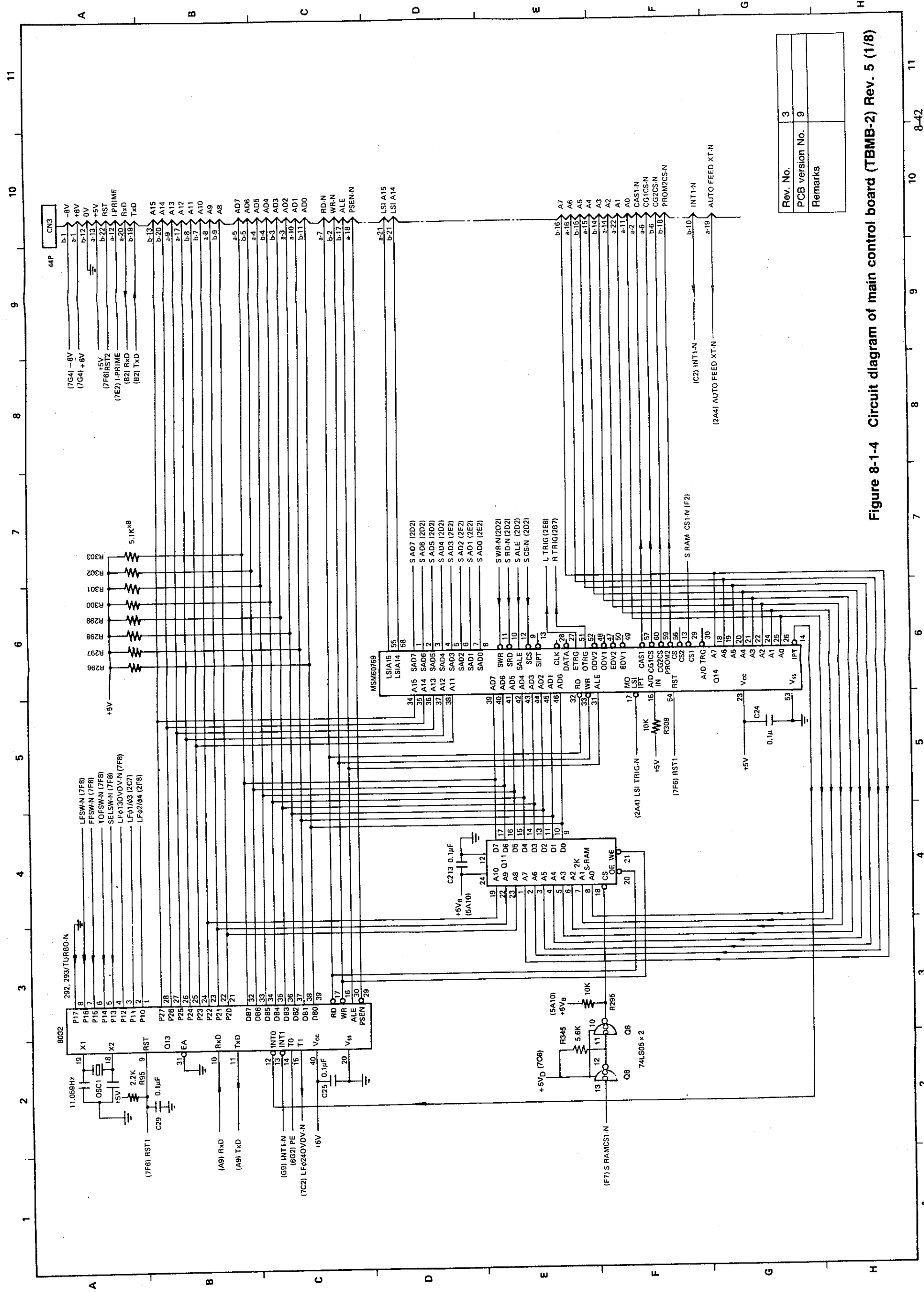
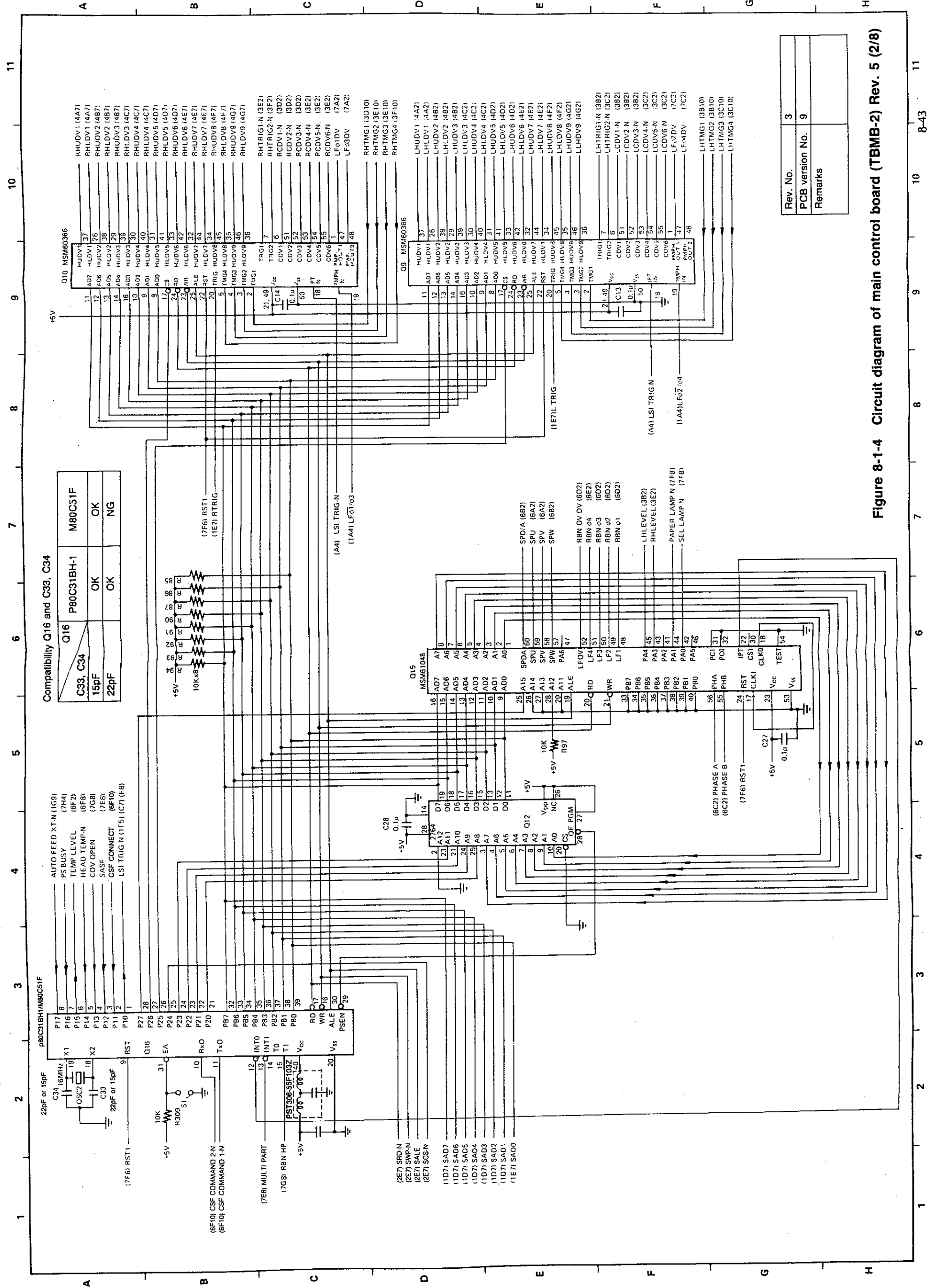


Figure 8-1-4 Circuit diagram of main control board (TBMB-2) Rev. 5 (1/8)



Compatibility Q16 and C33, C34

C33, C34	Q16	P80C31BH-1	M80C51F
15pF		OK	OK
22pF		OK	NG

Rev. No.	3
PCB version No.	9
Remarks	

Figure 8-1-4 Circuit diagram of main control board (TBMB-2) Rev. 5 (2/8)

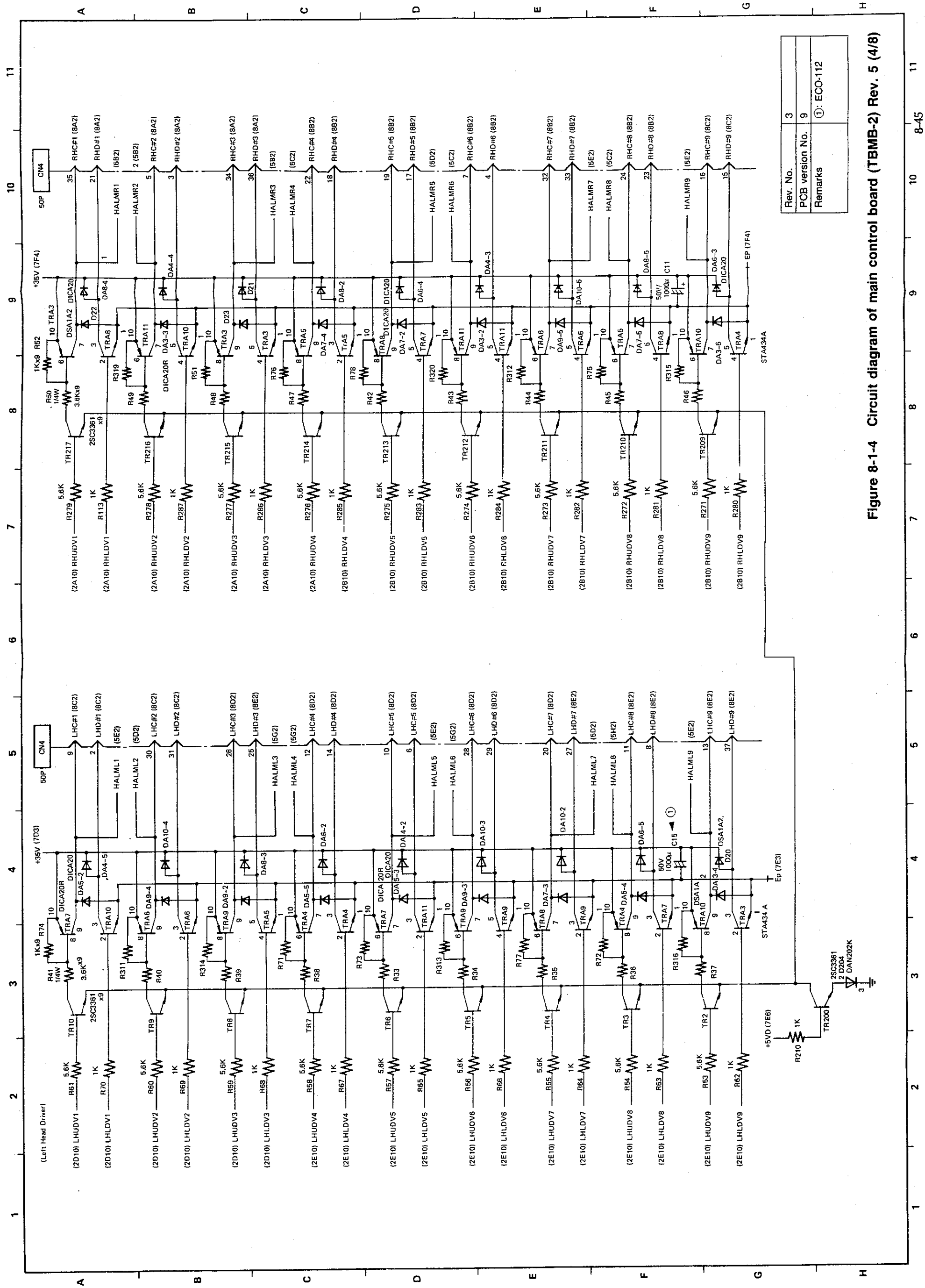
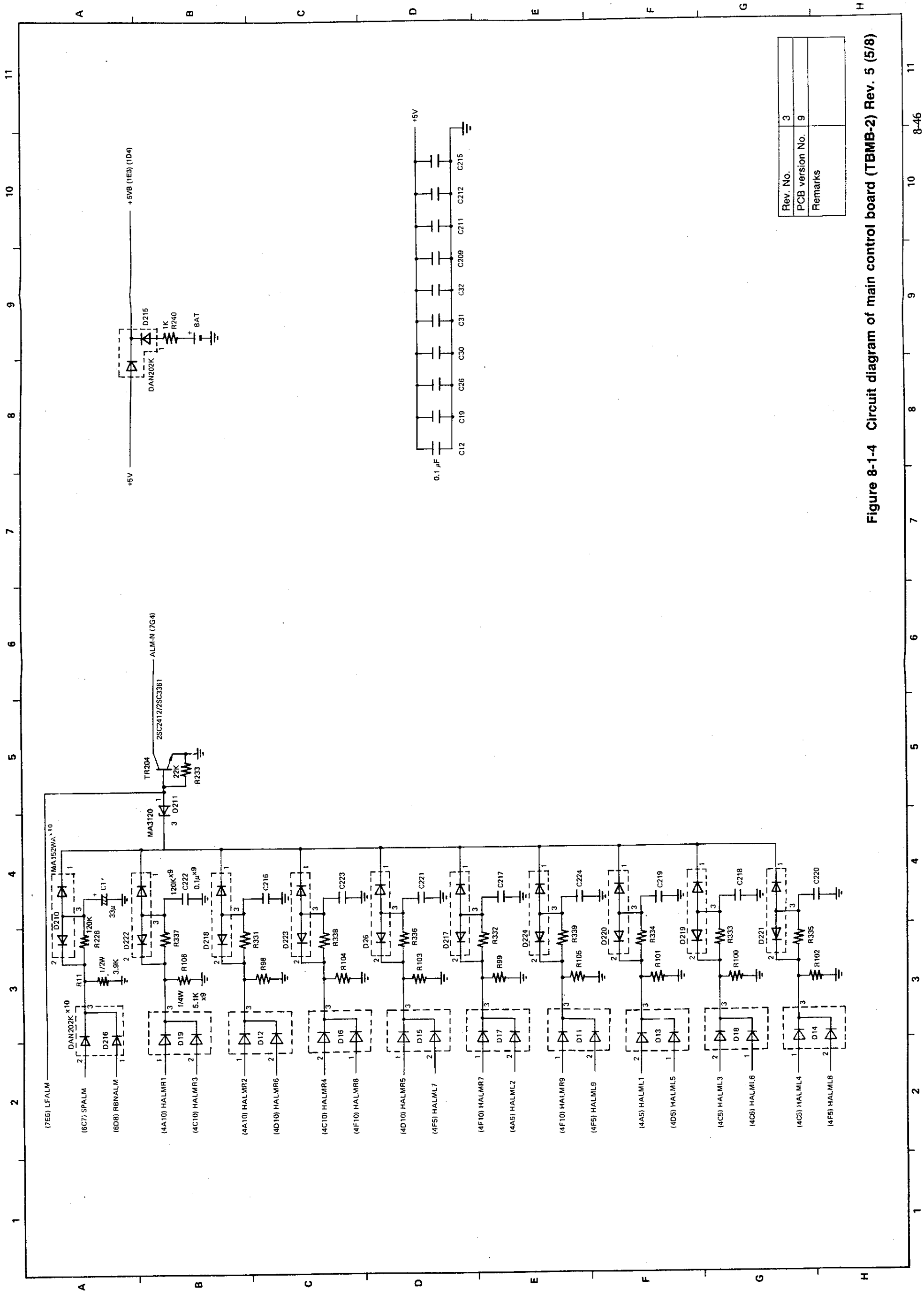


Figure 8-1-4 Circuit diagram of main control board (TBMB-2) Rev. 5 (4/8)



Rev. No.	3
PCB version No.	9
Remarks	

Figure 8-1-4 Circuit diagram of main control board (TBMB-2) Rev. 5 (5/8)

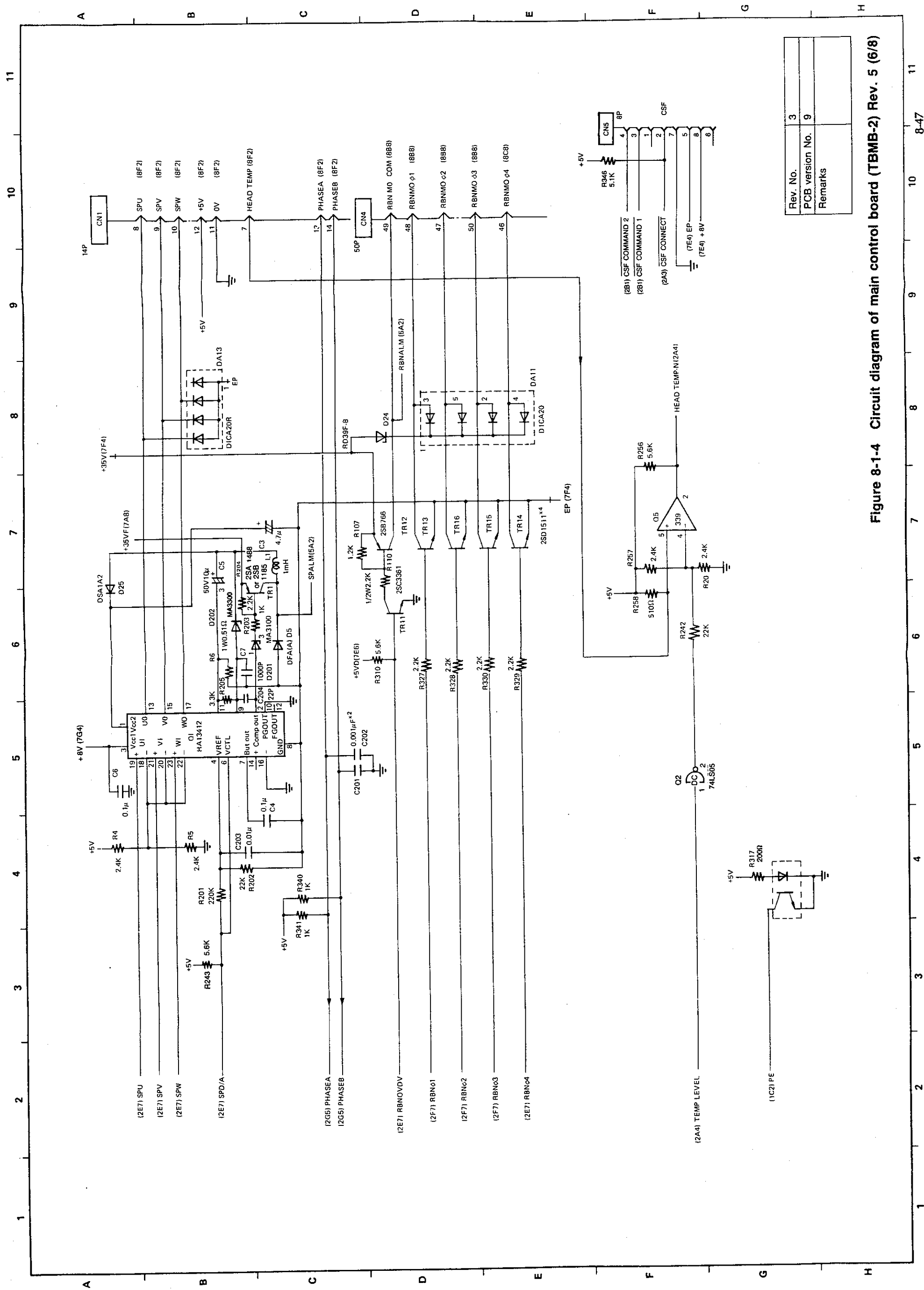


Figure 8-1-4 Circuit diagram of main control board (TBMB-2) Rev. 5 (6/8)

Rev. No.	3
PCB version No.	9
Remarks	

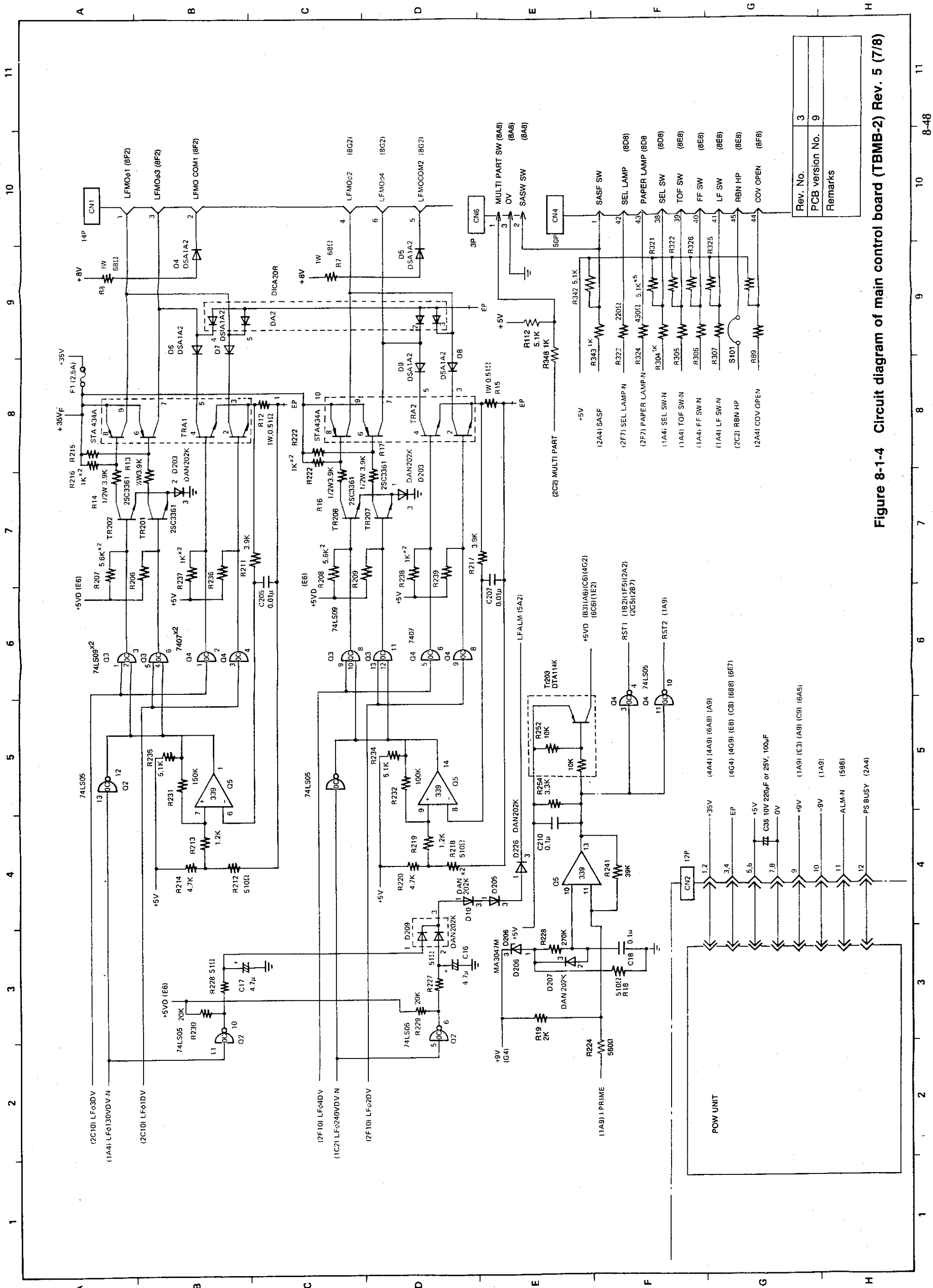


Figure 8-1-4 Circuit diagram of main control board (TBMB-2) Rev. 5 (7/8)

Rev. No.	3
PCB version No.	9
Remarks	

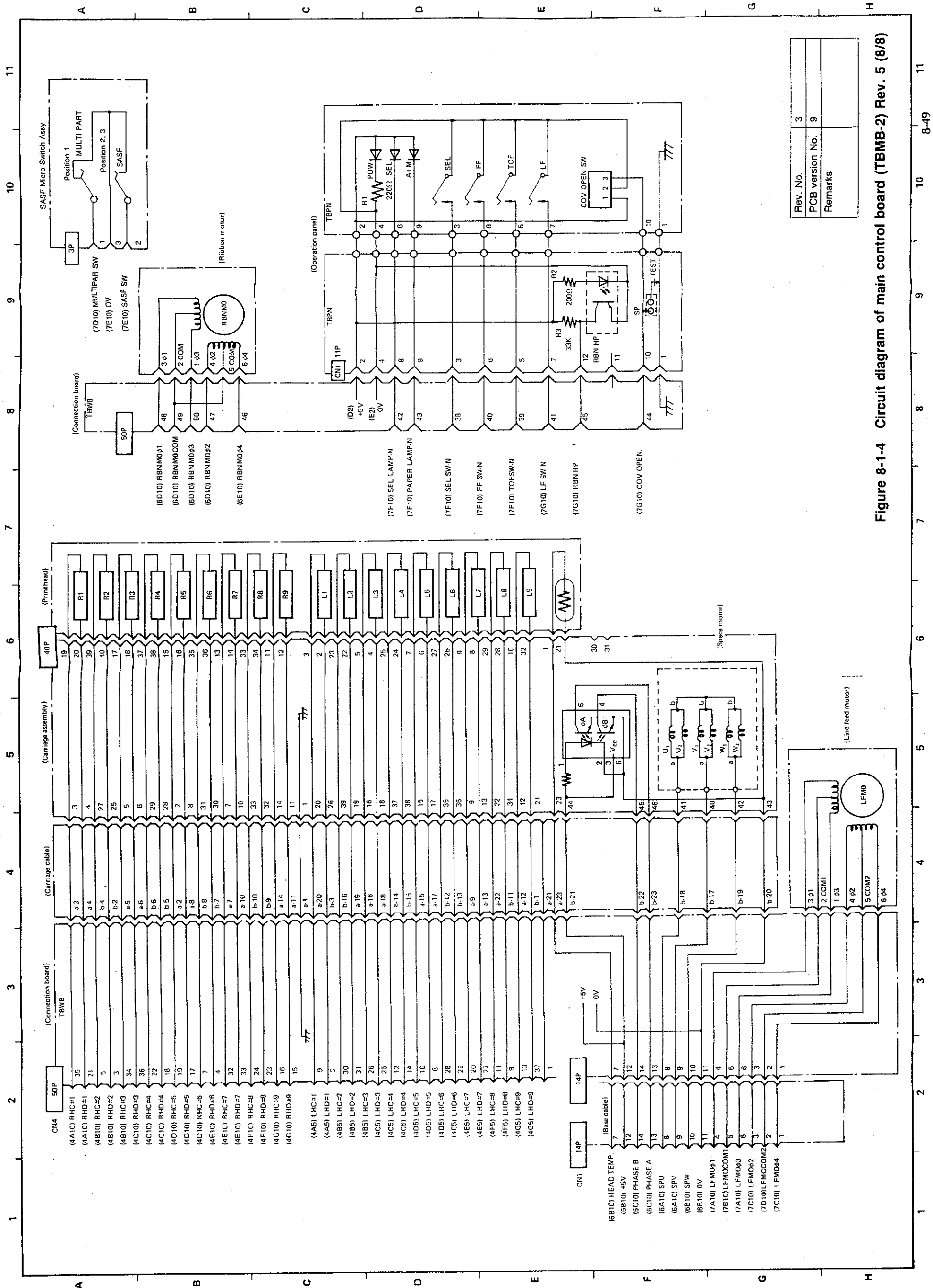


Figure 8-1-4 Circuit diagram of main control board (TBMB-2) Rev. 5 (8/8)

Rev. No.	3
PCB version No.	9
Remarks	

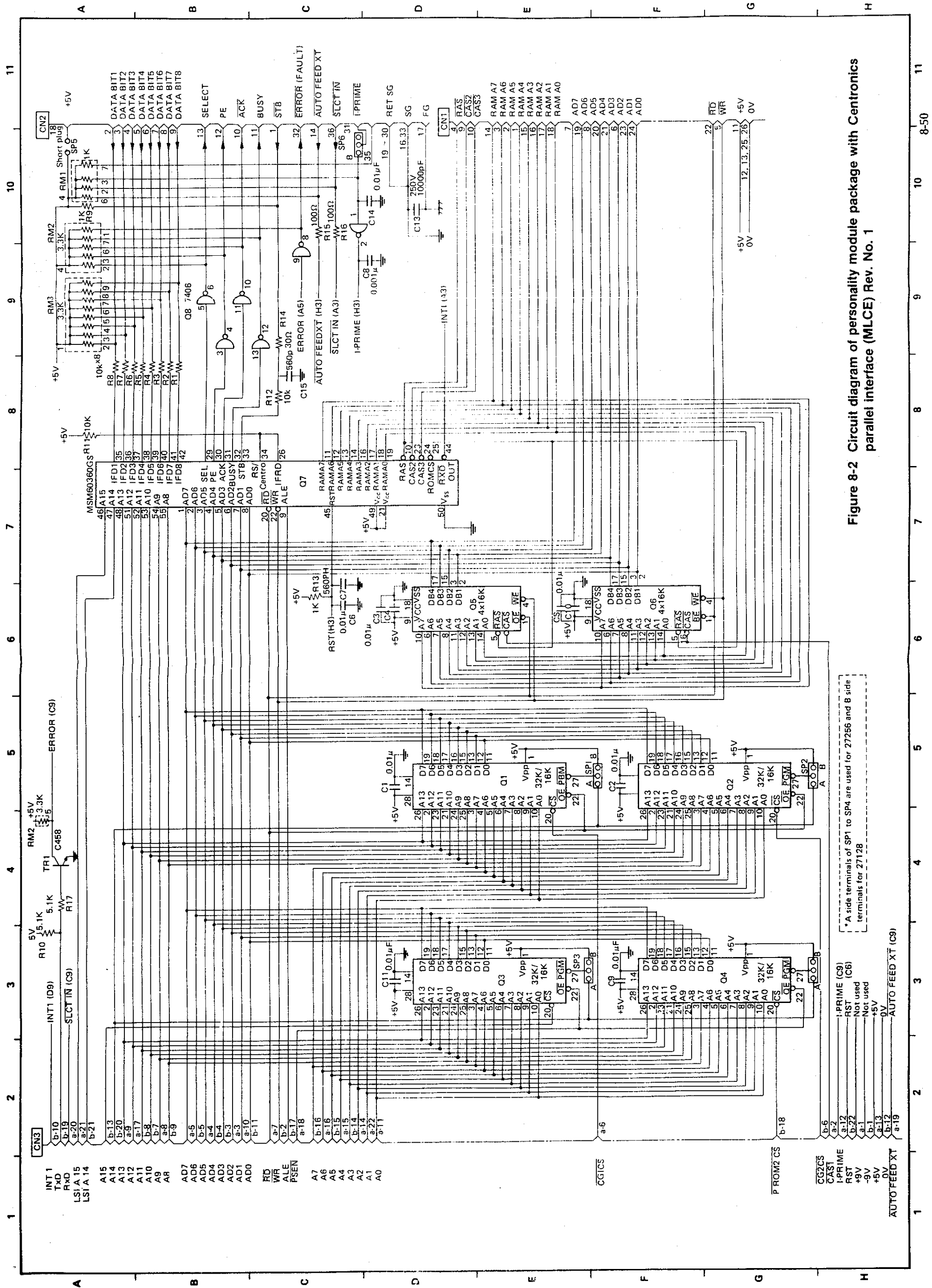


Figure 8-2 Circuit diagram of personality module package with Centronics parallel interface (MLCE) Rev. No. 1

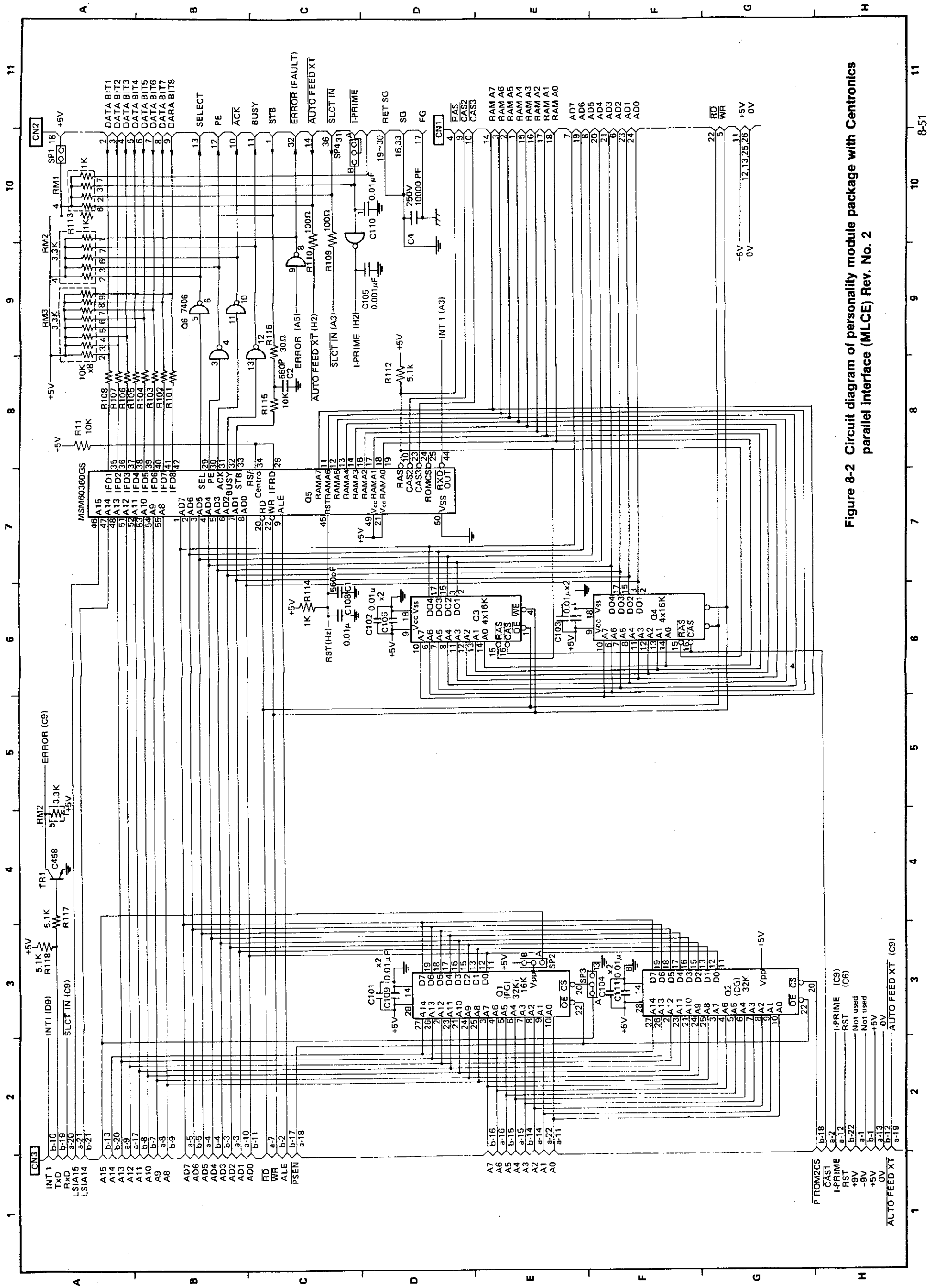


Figure 8-2 Circuit diagram of personality module package with Centronics parallel interface (MLCE) Rev. No. 2

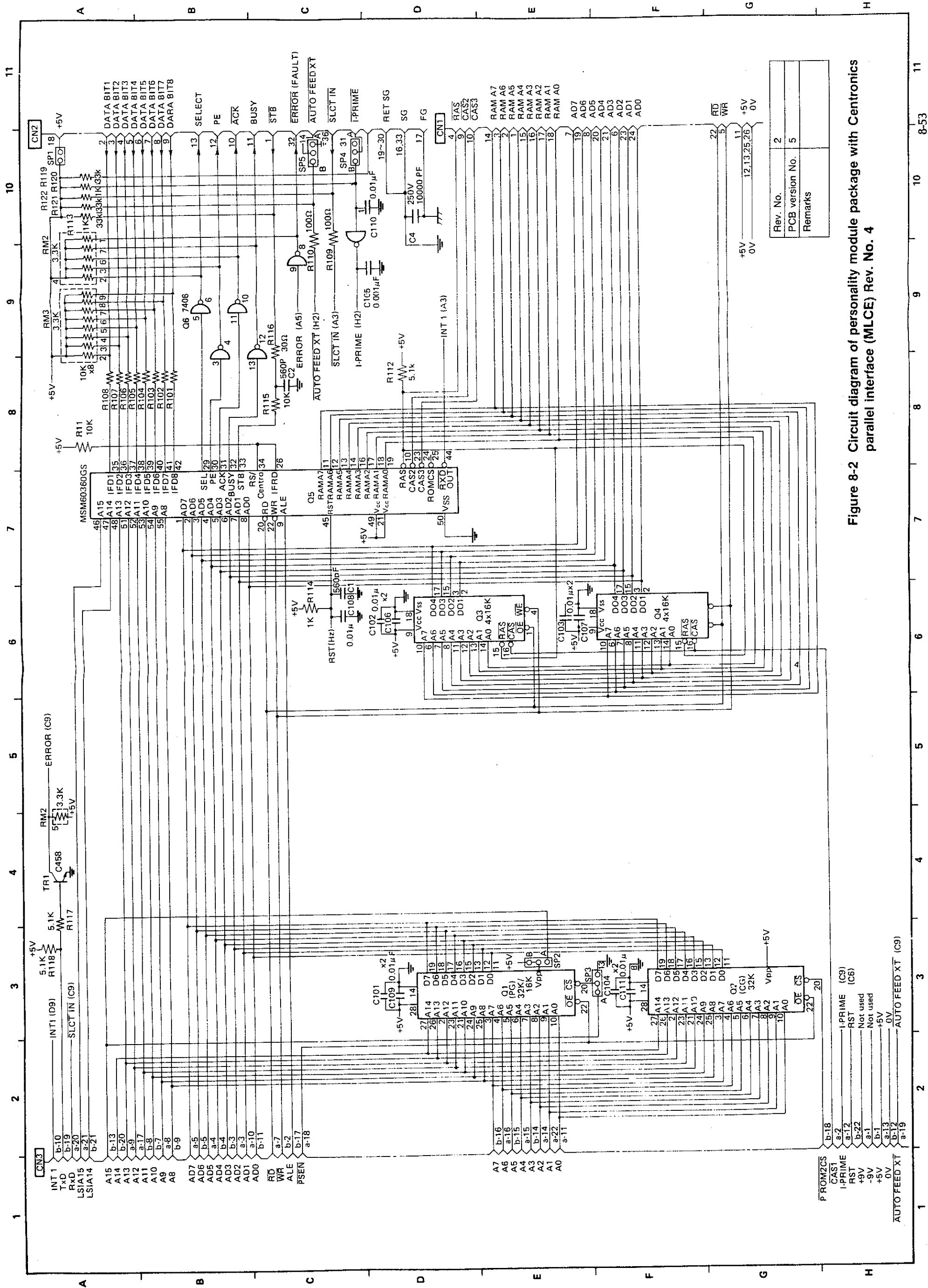
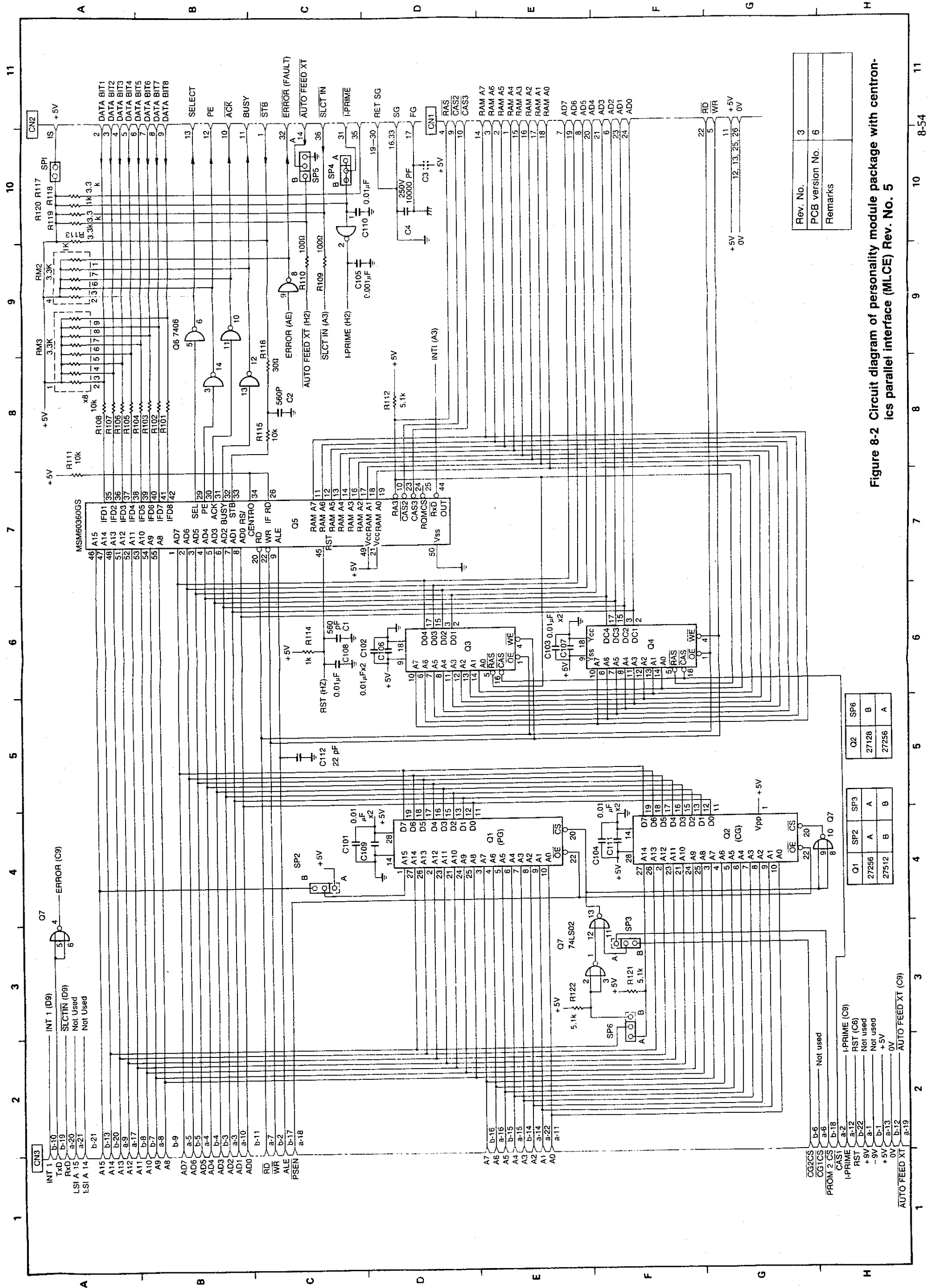


Figure 8-2 Circuit diagram of personality module package with Centronics parallel interface (MLCE) Rev. No. 4



Rev. No.	3
PCB version No.	6
Remarks	

Figure 8-2 Circuit diagram of personality module interface (MLCE) Rev. No. 5

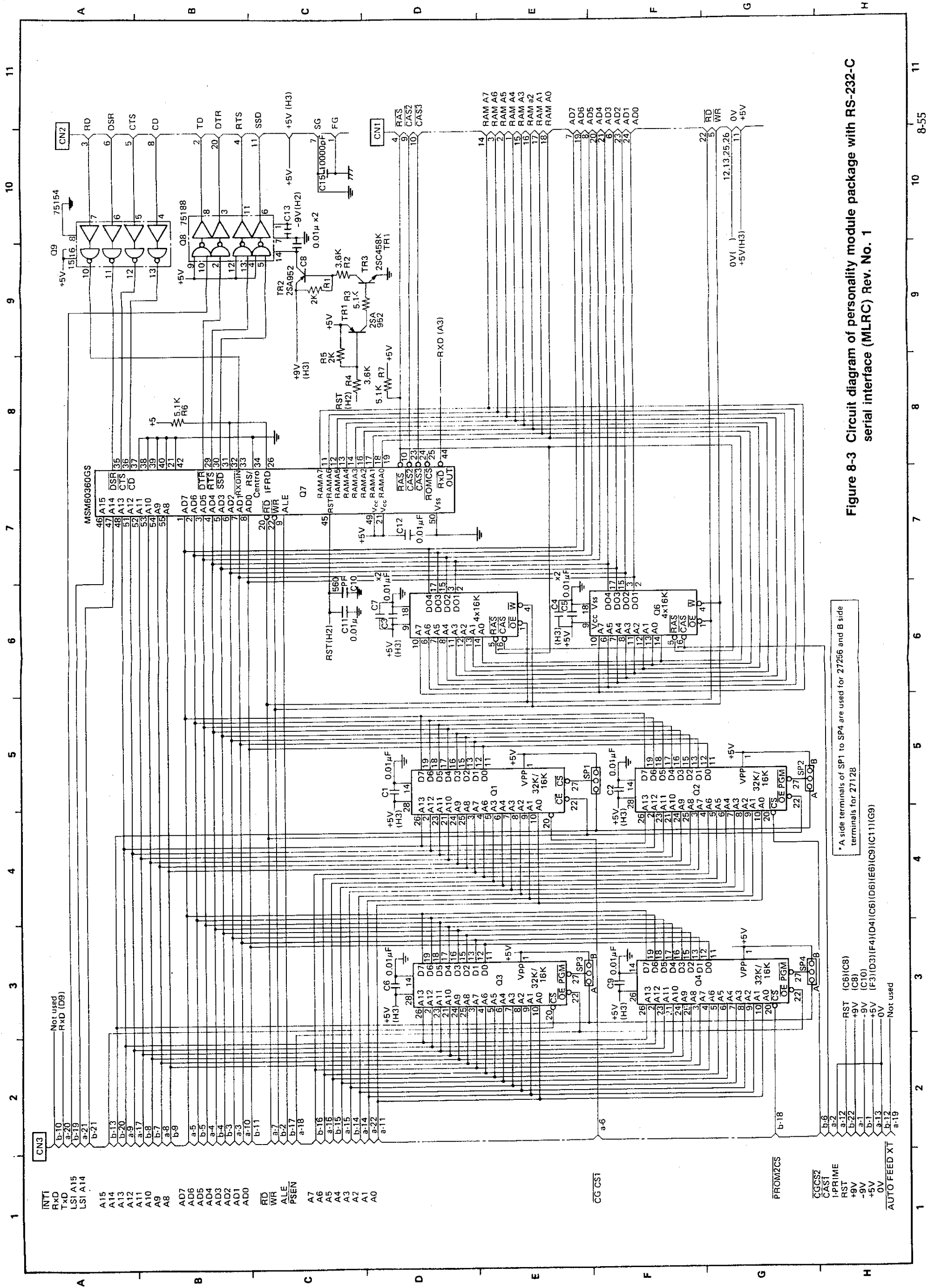


Figure 8-3 Circuit diagram of personality module package with RS-232-C serial interface (MLRC) Rev. No. 1

• A side terminals of SP1 to SP4 are used for 27256 and B side terminals for 27128

* A side terminal
terminals f

AUTO FEED XT
UV ☒ b-12 ☐ Not used

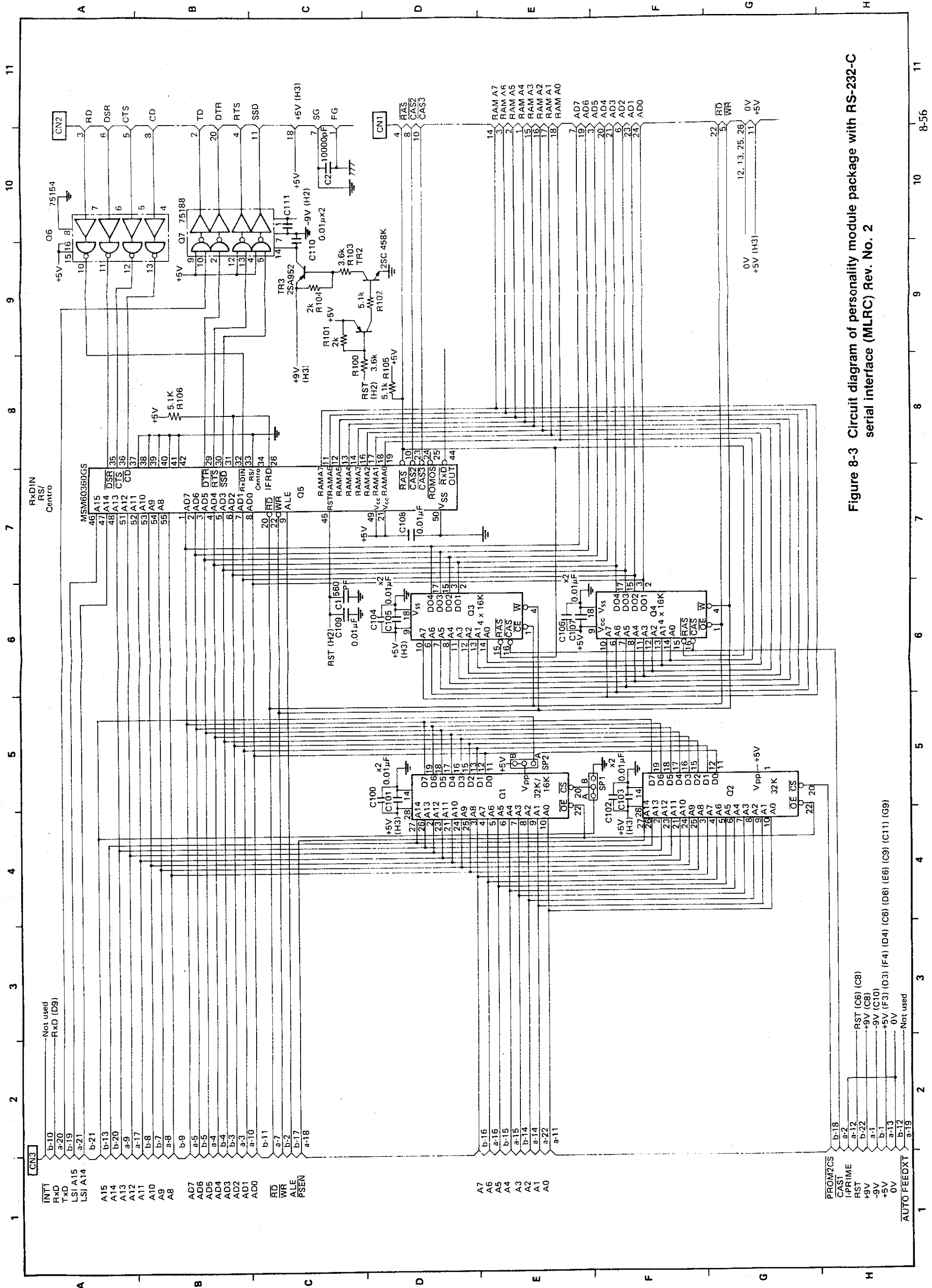
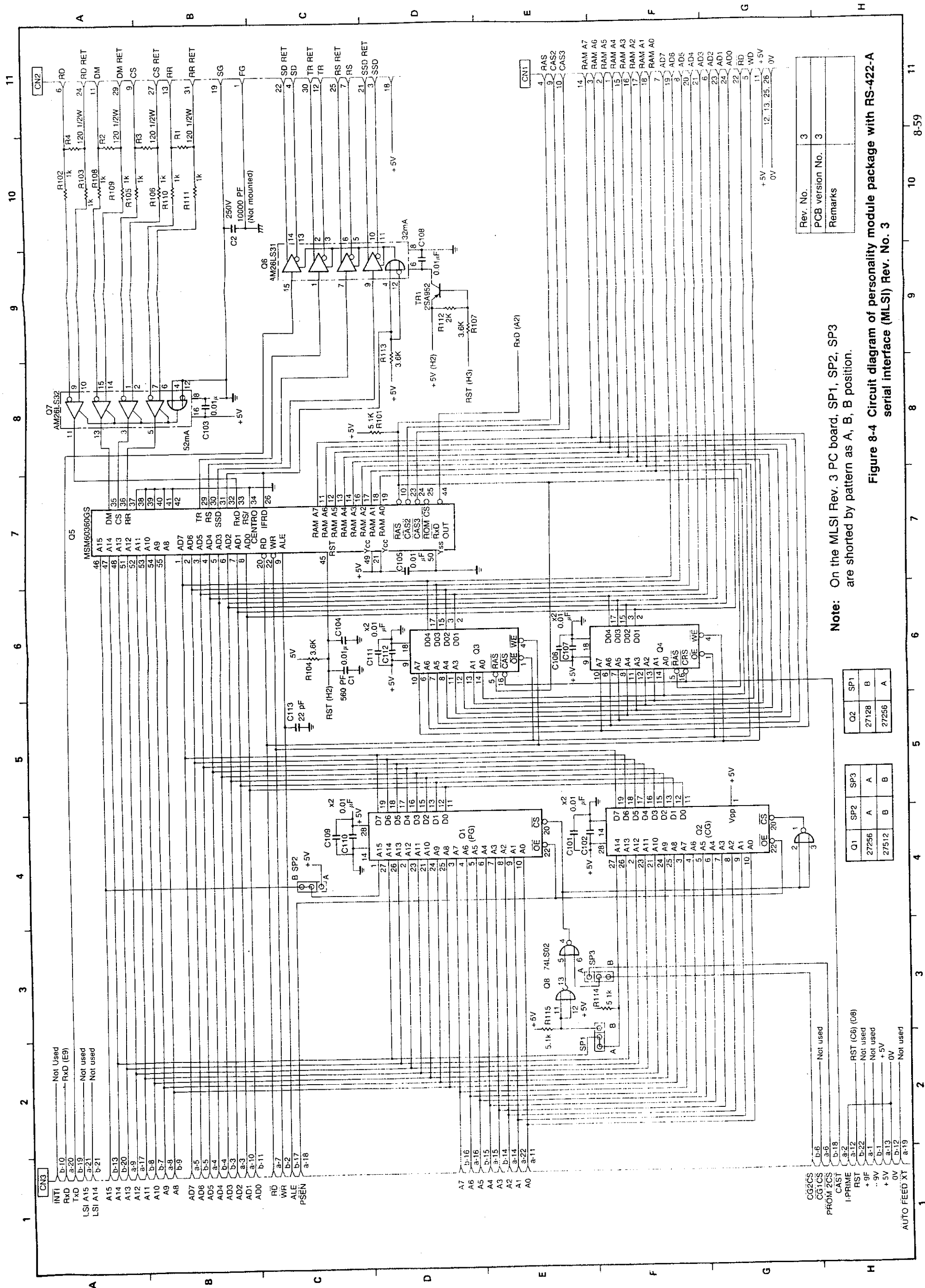
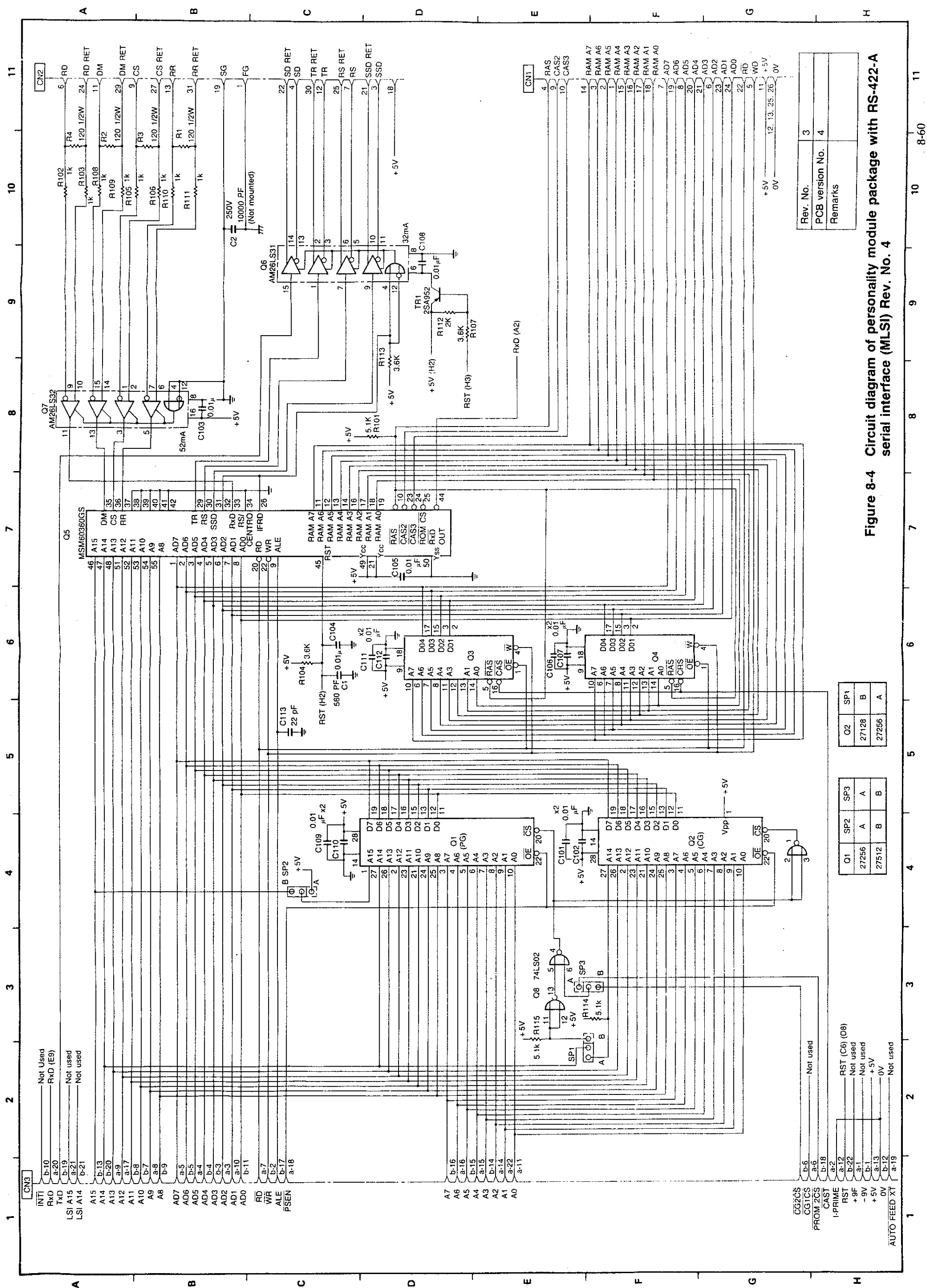


Figure 8-3 Circuit diagram of personality module package with RS-232-C serial interface (MLRC) Rev. No. 2





Rev. No.	3
PCB version No.	4
Remarks	

Figure 8-4 Circuit diagram of personality module package with RS-422-A serial interface (MLSI) Rev. No. 4

Q2	SP1
27128	B
27256	A

Q1	SP2	SP3
27256	A	A
27512	B	B

CG20S	Not used
CG1CS	Not used
PROM2CS	Not used
CAST	Not used
I-PRIME	Not used
RST	Not used
+9V	Not used
-9V	Not used
+5V	Not used
0V	Not used
AUTO FEED XT	Not used

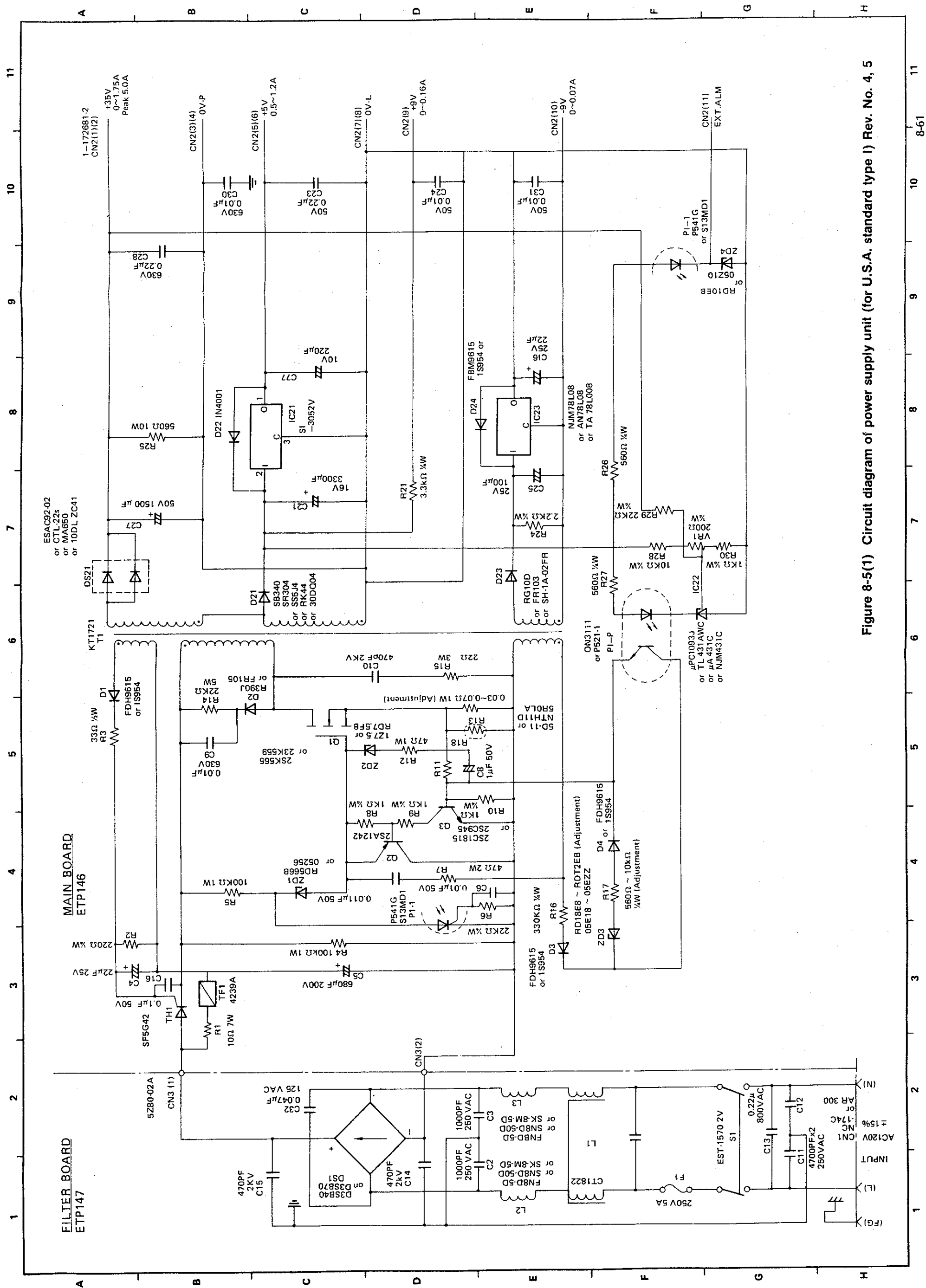


Figure 8-5(1) Circuit diagram of power supply unit (for U.S.A. standard type I) Rev. No. 4, 5

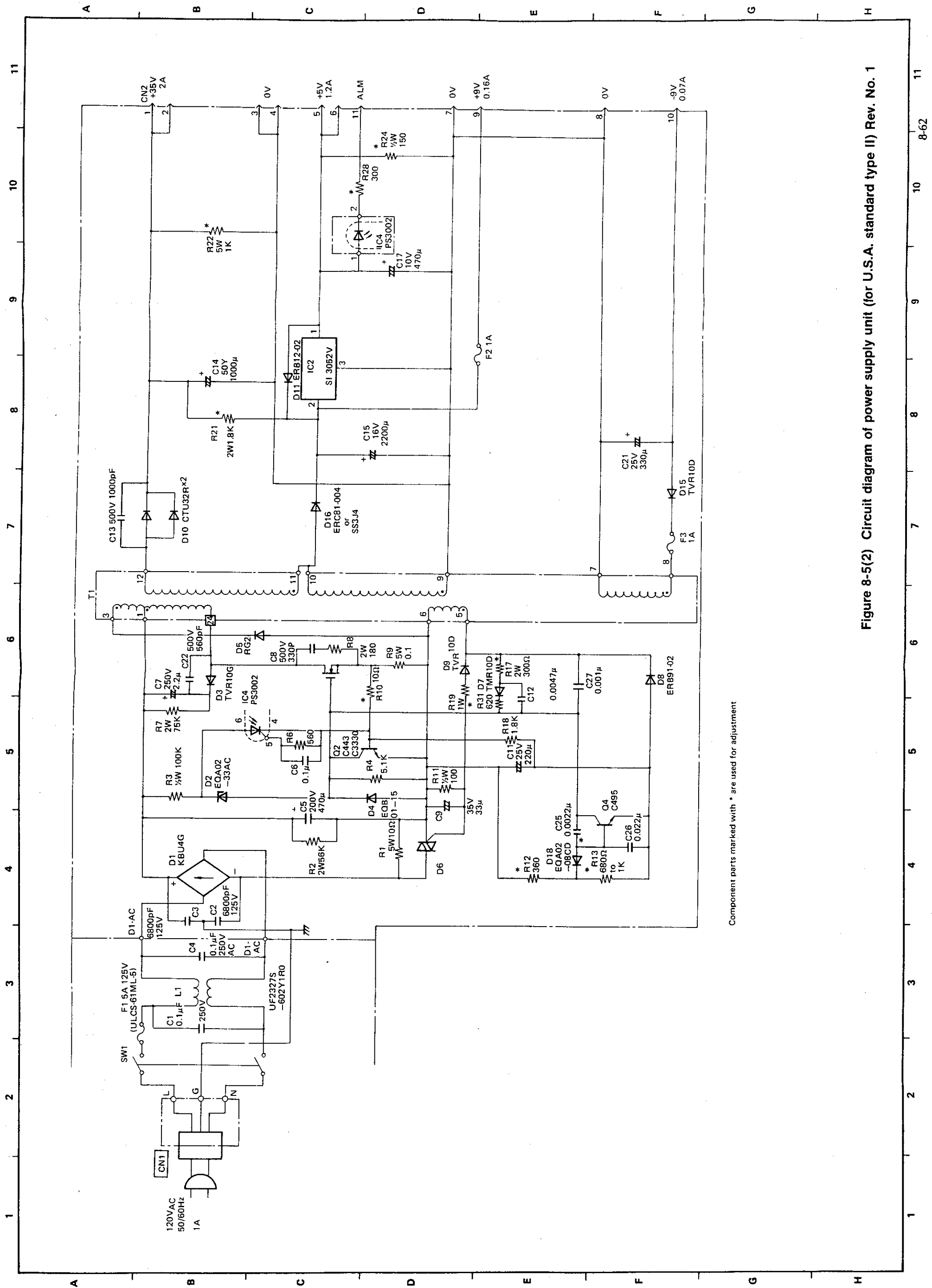
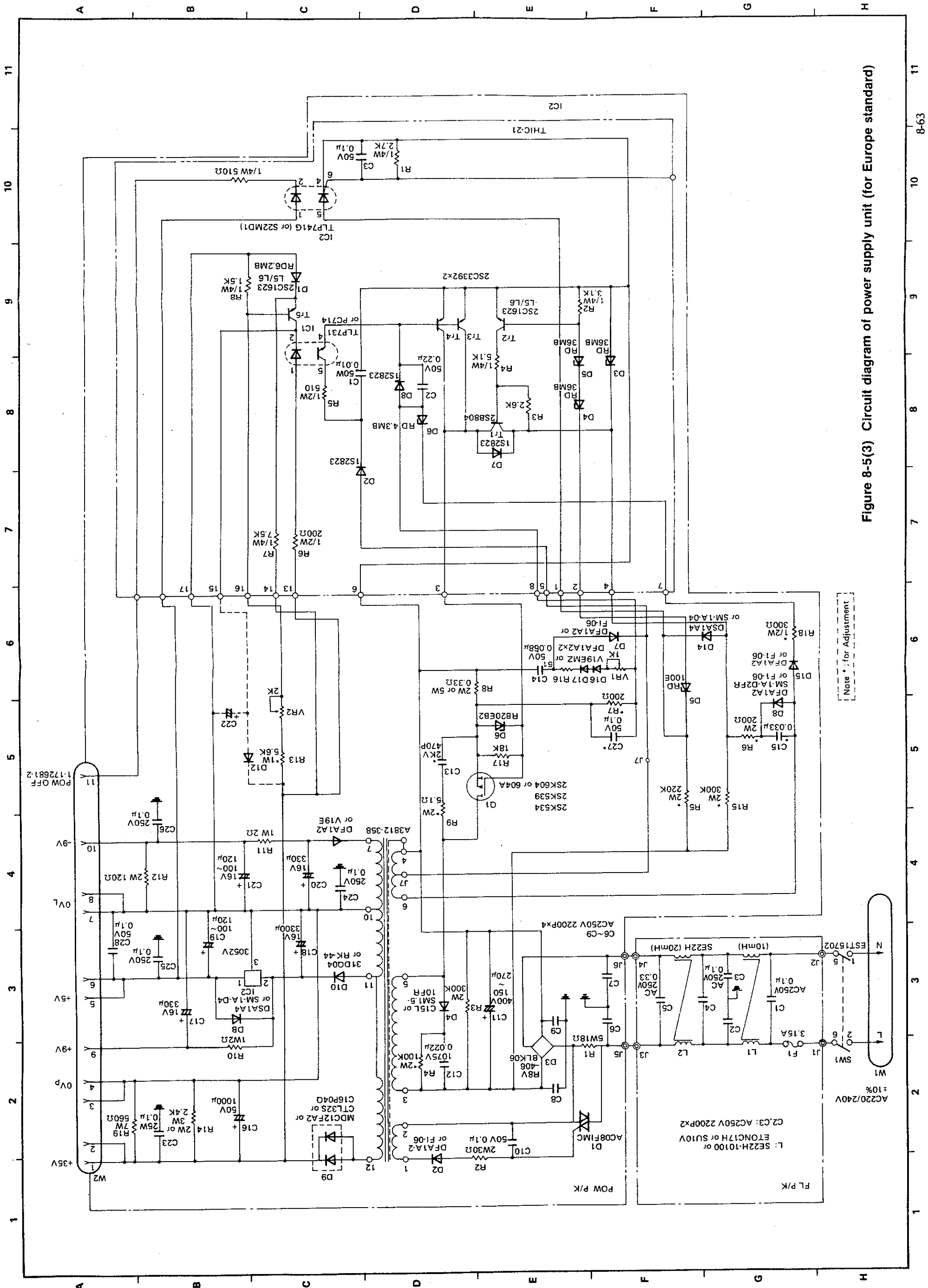
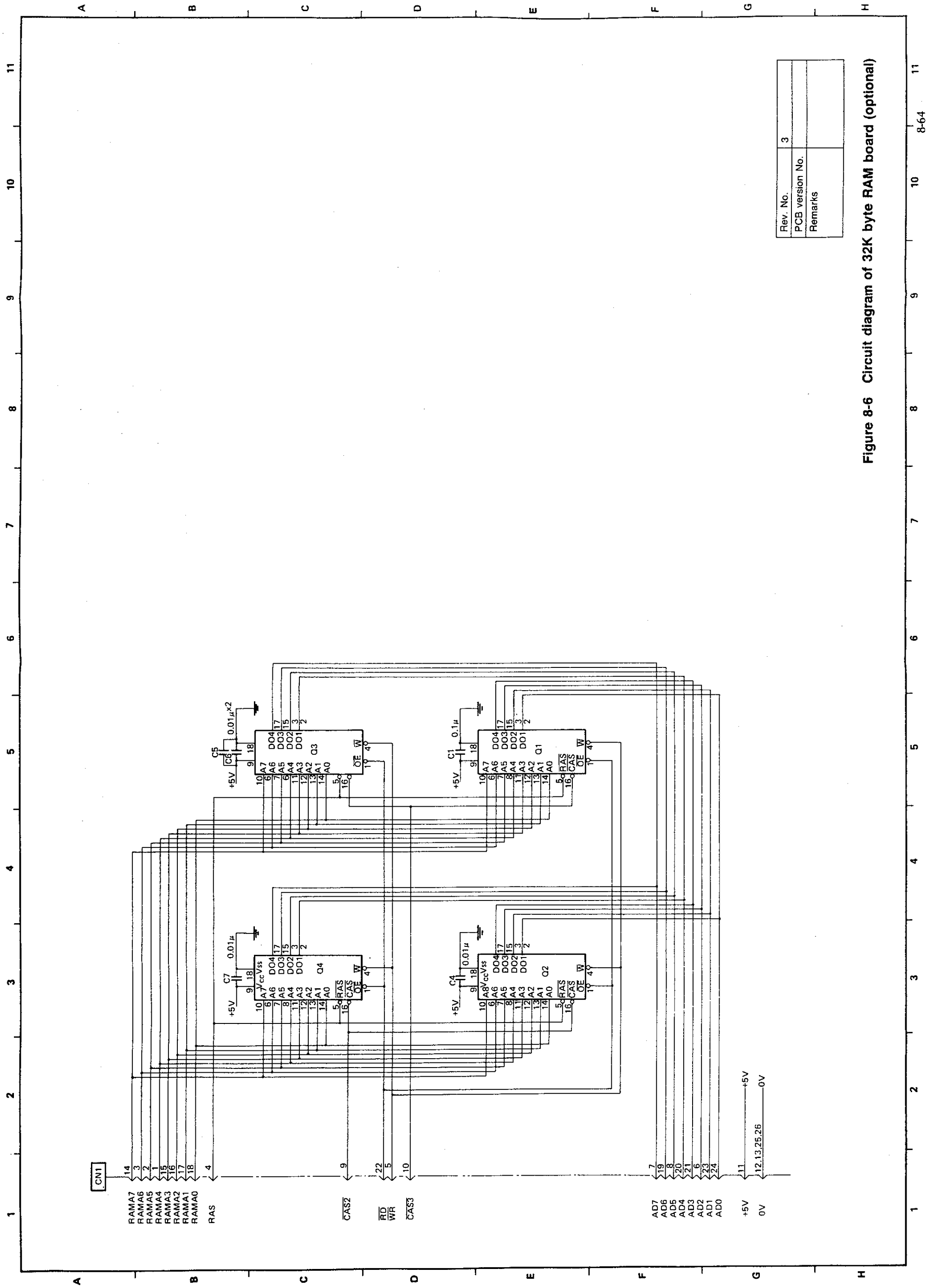


Figure 8-5(2) Circuit diagram of power supply unit (for U.S.A. standard type II) Rev. No. 1





Rev. No.	3
PCB version No.	
Remarks	

Figure 8-6 Circuit diagram of 32K byte RAM board (optional)

9. LIST OF COMPONENT PARTS

9. LIST OF COMPONENT PARTS

Figure 9-1 Printer unit

Figure 9-2 Printing mechanism

Figure 9-3 Personality module package with Centronics parallel interface

Figure 9-4 Interface module package with RS-232-C serial interface

Figure 9-5 Interface module package with RS-422-A serial interface

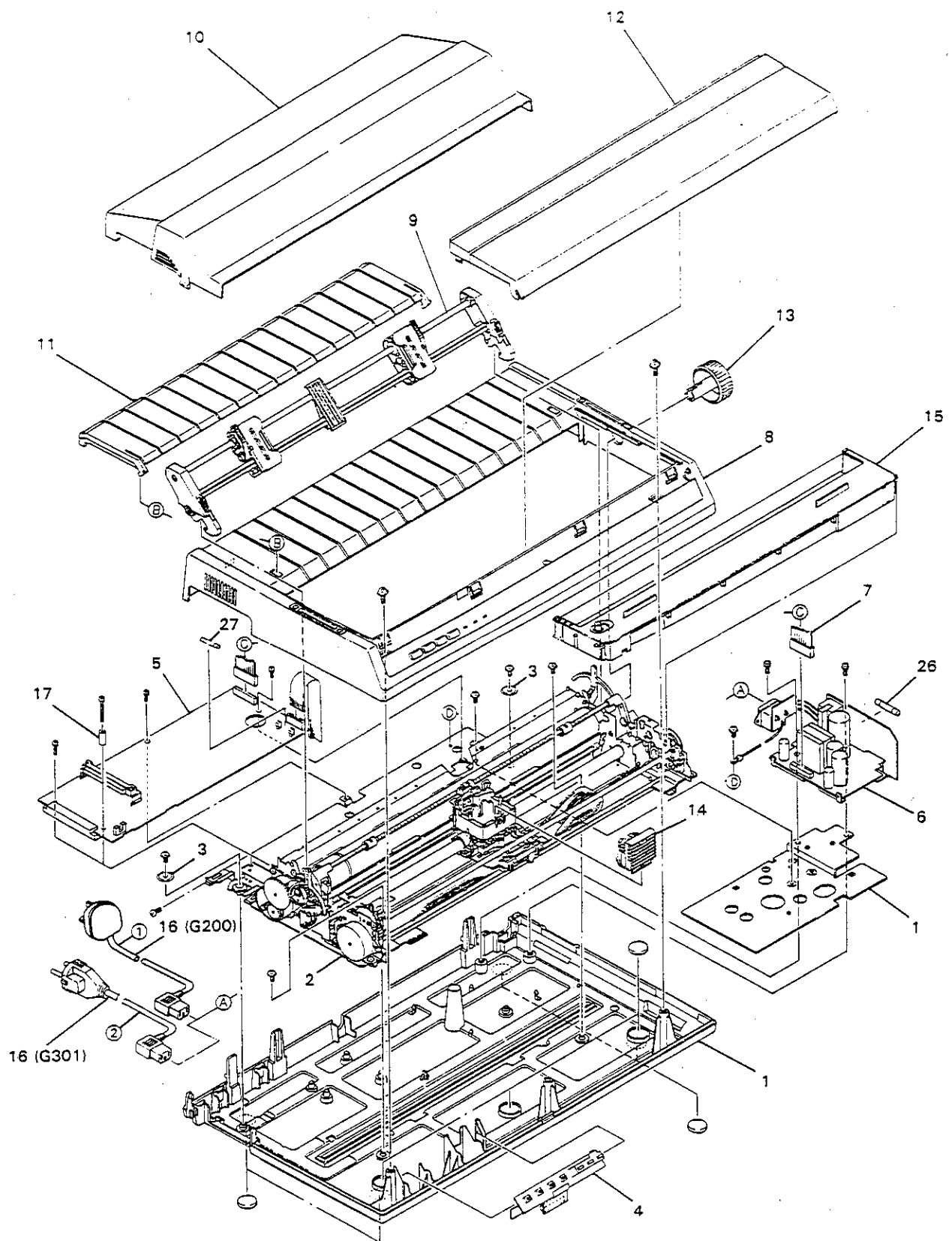


Figure 9-1 Printer unit

Table 9-1 Printer Unit

No.	Name/Rating	Part No.	Q'ty	Remarks
1	Lower cover assembly	3PA4016-3151G2	1	
2	Printing mechanism	3YX4044-1587G1	1	
3	Washer	4PP4025-1152P1	2	
4	TBPN Printed Circuit Board	2YU5003-5669G1	1	
5	TBMB-2 Printed Circuit Board	4YA4042-1141G22	1	
6	Power supply unit	4YB4049-1143P3	1	② Europe Std.
7	Power connection cable	4YS4011-4798G4	1	
8	Upper cover assembly	3PA4016-3150G1	1	
9	Tractor feed unit	3PA4025-2633G2	1	
10	Acoustic cover	2PB4016-3126P2	1	
11	Paper separator	3PA4016-3678G1	1	
12	Access cover	2PP4044-1691G1	1	
13	Platen knob	4PB4043-2156P1	1	
14	Printhead	4YA4025-1601G2	1	
15	Ribbon cartridge (black)	2PA4043-1930G9	1	(1 pc contained)
15	Ribbon cartridge (black)	3PA4043-2129G5	1	(6 pcs contained)
15	Ribbon cartridge (color)	2PA4043-1930G10	1	(1 pc contained)
15	Ribbon cartridge (color)	3PA4043-2129G6	1	(6 pcs contained)
16	AC cord	3YS4011-1051P1	1	① British Std.
16	AC cord	3YS4011-1052P1	1	② Europe Std.
17	Collar	4PP4043-2182P1	1	
18	Screw for FG	4PB4043-2200P1	1	
26	Fuse (3.15A)	540A2044S2322	1	② Europe Std.
27	Fuse (2.5A)	540A2036M1252	1	

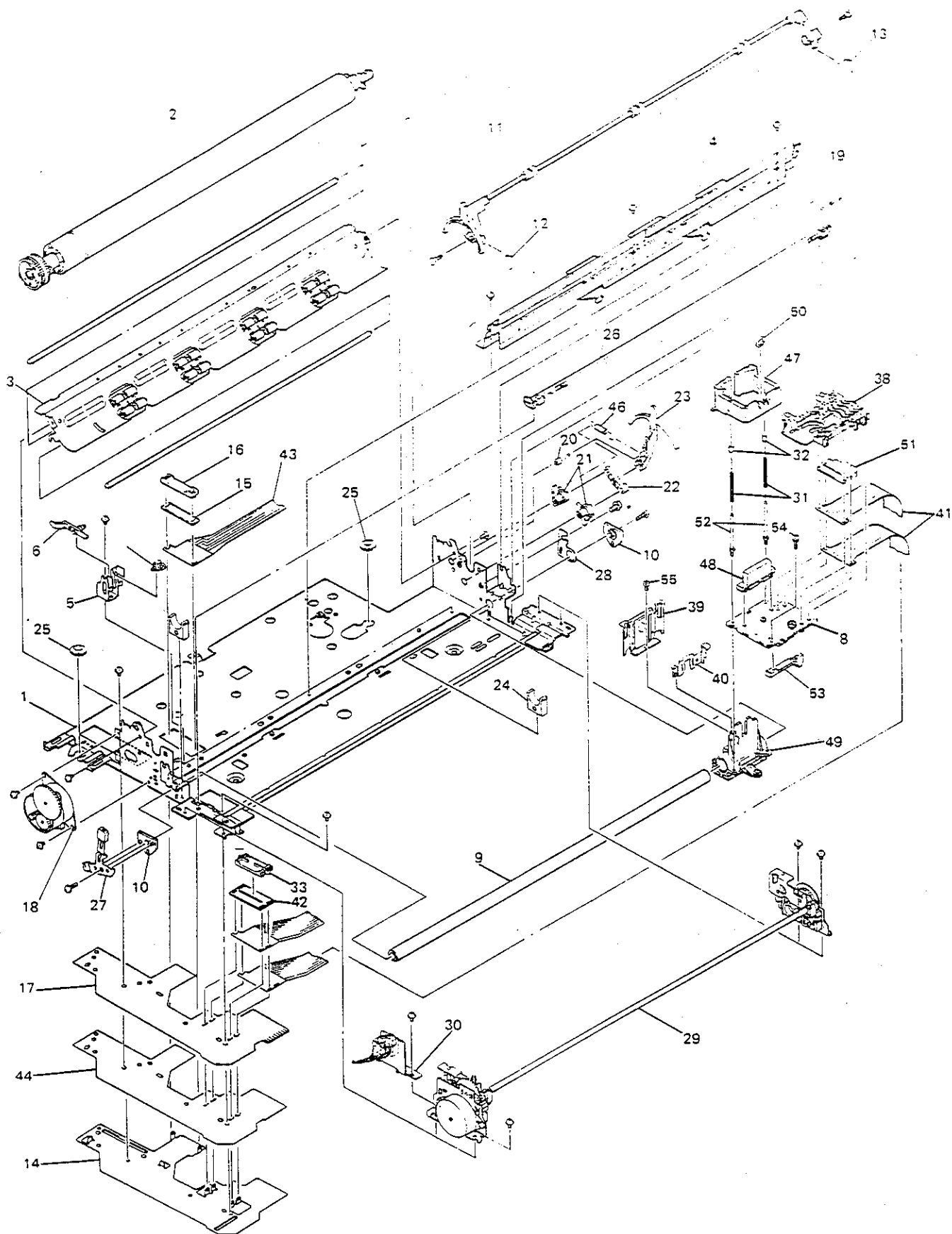


Figure 9-2 Printer mechanism

Table 9-2 Printer Mechanism (1/2)

No.	Name/Rating	Part No.	Q'ty	Remarks
1	Base frame	3PP4044 -1642G1	1	
2	Platen assembly	4PA4025-1203G2	1	
3	Paper chute assembly	3PA4043-1923G1		
4	Bottom paper guide	2PP4043-1926G1	1	
5	Near end bracket	4PP4043-1918P1	1	
6	Near end lever	4PB4043-1940P1	1	
7	Bottom near end lever	4PB4025-1040P1	1	
8	Space motor assembly	4YX4044 -1607G1	1	*
9	Carriage shaft	4PP4043-1953P2	1	
10	Carriage shaft boss	4PB4043-1954P1	2	
11	Column indicator assembly	3PA4043-1956G2	1	
12	Front pressure spring (L)	4PP4043-1959P1	1	
13	Front pressure spring (R)	4PP4043-1960P1	1	
14	Circuit board support	3PP4044-1639P1	1	
15	Contact rubber	4PP4025-1099P2	1	
16	Cable clamp	4PB4025-1100P1	1	
17	TBWB P.C.B.	2PU4003-5038P1	1	
18	LF motor	4PB4044-1640P1	1	
19	Tension spring	4PB4025-1106P1	1	
21	Release link A	3PB4043-1962P1	2	
22	Release link B	4PB4043-1963P1	1	
23	Release lever	4PB4043-1964P1	1	
24	Rubber stopper	4PB4043-1965P1	2	
25	Grommet	4PB4025-1159P1	2	
26	Space rack	4PK4044 -1650G1	1	
27	Adjusting lever	4PP4044 -1920G1	1	*
28	Adjusting plate	4PP4043-2124P1	1	
29	Ribbon drive assembly	3YX4043-2183G2	1	
30	Semi-automatic sheet feed assembly	4YX4044 -1922G1	1	*

Note: *Not contained in printing mechanism configuration

Table 9-2 Printer Mechanism (2.2)

No.	Name/Rating	Part No.	Q'ty	Remarks
31	Bias spring	4PP4043-1952P1	2	
32	Slide bush	4PP4043-2238P1	2	
33	Cable clamp	4PB4044 -1652P1	1	
38	Carriage cover	2PB4044 -1697P1	1	
39	Ribbon protector	4PP4043-1947G1	1	
40	Head clamp	4PP4043-2149G1	1	
41	Carriage cable	2PU4007-1023P1	2	
42	Contact rubber	4PP4044-1644P1	1	
43	Base cable	2PU4007-1024P1	1	
44	Insulator	2PP4044-1670P1	1	
46	Bias spring B	4PB4043-2331P1	1	
47	Front ribbon guide	3PB4043-1951P1	1	
48	Connector	3PB4025-1242P1	1	
49	Carriage frame	4PP4043-1942G2	1	
50	Ribbon shift roller	4PB4043-1966P1	1	
51	Contact pressure rubber	4PP4044-1620P1	1	
52	Ribbon guide stud	4PP4043-1950P1	2	
53	Slider	4PB4025-1088P1	1	
54	Small pan head screw	⊕ P (SW + W) 3-8-HH	1	
55	Small pan head screw	⊕ P3 - 4 -HH	1	

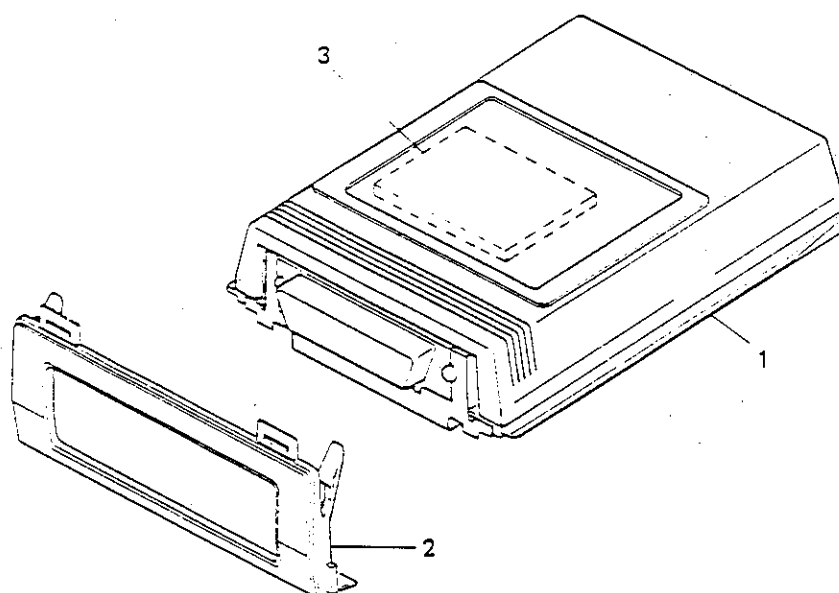


Figure 9-3 Personality module package with Centronics parallel interface

Table 9-3 Personality module package with Centronics interface

No.	Name/Rating	Part No.	Q'ty	Remarks
1	Centronics parallel interface module	4YA4042-1343G230	1	OKIDATA Std.
1	Centronics parallel interface module	4YA4042-1343G231	1	OKIDATA IBM compatible
1	Centronics parallel interface module	4YA4042-1343G232	1	OKIDATA Std. with RAM board
1	Centronics parallel interface module	4YA4042-1343G233	1	OKIDATA IBM with RAM board
1	Centronics parallel interface module	4YA4042-1343G234	1	OKI Std.
1	Centronics parallel interface module	4YA4042-1343G235	1	OKI IBM compatible
1	Centronics parallel interface module	4YA4042-1343G236	1	OKI Std. with RAM board
1	Centronics parallel interface module	4YA4042-1343G237	1	OKI IBM compatible with RAM board
2	Locking cover	2PB4016-3121P1	1	
3	RAM board (option)	4YA4042-1065G3	1	

Note: Table 9-3 can be applied to Rev. 3 PCB ver. 6 and or later revisions.

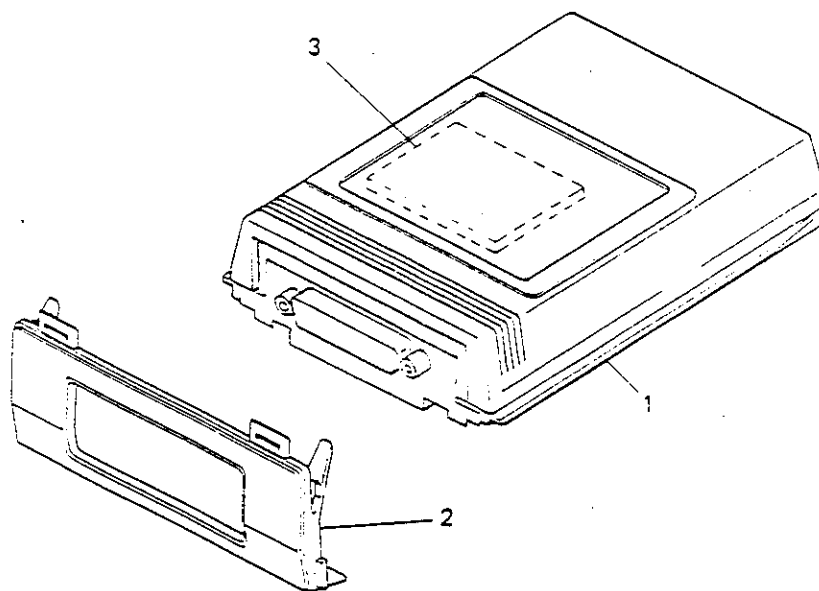


Figure 9-4 Personality module package with RS-232-C serial interface

Table 9-4 Personality module package with RS-232-C serial interface

No.	Name/Rating	Part No.	Q'ty	Remarks
1	RS-232-C serial interface module	4YA4042-1344G230	1	OKIDATA Std.
1	RS-232-C serial interface module	4YA4042-1344G231	1	OKIDATA IBM compatible
1	RS-232-C serial interface module	4YA4042-1344G232	1	OKIDATA Std. with RAM board
1	RS-232-C serial interface module	4YA4042-1344G233	1	OKIDATA IBM with RAM board
1	RS-232-C serial interface module	4YA4042-1344G234	1	OKI Std.
1	RS-232-C serial interface module	4YA4042-1344G235	1	OKI IBM compatible
1	RS-232-C serial interface module	4YA4042-1344G236	1	OKI Std. with RAM board
1	RS-232-C serial interface module	4YA4042-1344G237	1	OKI IBM compatible with RAM board
2	Locking cover	2PB4016-3146P1	1	
3	RAM board (option)	4YA4042-1065G3	1	

Note: Table 9-4 can be applied to Rev. 3 and PCB ver. 4 or later revisions.

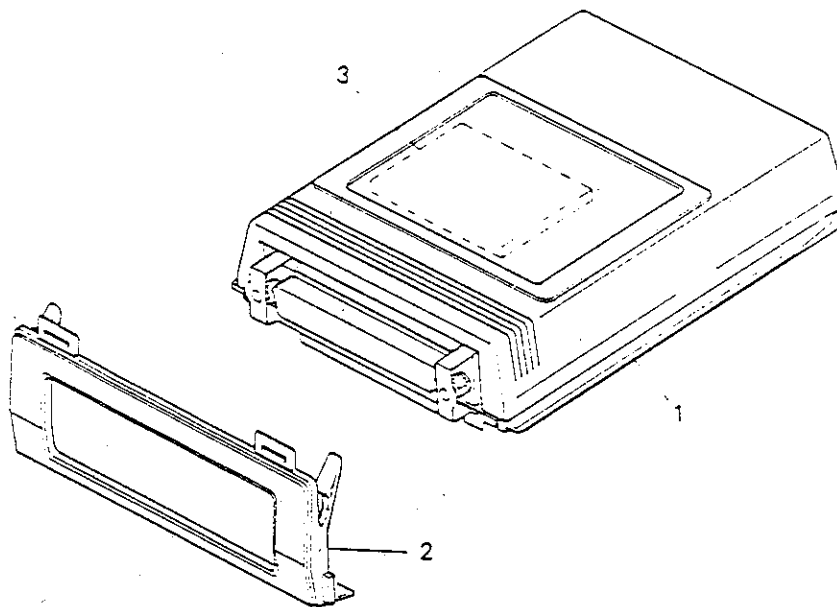


Figure 9-5 Personality module package with RS-422-A serial interface

Table 9-5 Personality module package with RS-422-A serial interface

No.	Name/Rating	Part No.	Q'ty	Remarks
1	RS-422-A serial interface module	4YA4042-1346G230	1	OKIDATA Std.
1	RS-422-A serial interface module	4YA4042-1346G231	1	OKIDATA IBM compatible
1	RS-422-A serial interface module	4YA4042-1346G232	1	OKIDATA Std. with RAM board
1	RS-422-A serial interface module	4YA4042-1346G233	1	OKIDATA IBM with RAM board
1	RS-422-A serial interface module	4YA4042-1346G234	1	OKI Std.
1	RS-422-A serial interface module	4YA4042-1346G235	1	OKI IBM compatible with RAM board
1	RS-422-A serial interface module	4YA4042-1346G236	1	OKI Std. with RAM board
1	RS-422-A serial interface module	4YA4042-1346G237	1	OKI IBM compatible with RAM board
2	Locking cover	2PB4016-3121P1	1	
3	RAM board (option)	4YA4042-1065G3	1	

Note: Table 9-5 can be applied to Rev. 3 and PCB ver. 3 or later revisions.

PARTS LIST CHANGE RECORD ML294 (1/3)

Table	Item	ECO No.	Old Part	New Part	Description	Compatibility
9-1	5	ML200-065	TBMB PCB 4YA4042-1141G1	TBMB-2 PCB 4YA4042-1141G22	The PCB with CN5 (for CSF) is applied for ODC.	No
	8		Upper cover assy 3PA4016-3150G2	3PA4016-3150G1	Correction	
	11		Paper separator 2PA4016-4135	3PA4016-3678G1	Correction	
	15		Ribbon cartridge 2PA4043-1930G5 3PA4043-2129G1 2PA4043-1930G6 3PA4043-2129G2	2PA4043-1930G9 3PA4043-2129G5 2PA4043-1930G10 3PA4043-2129G6	Correction	
	16		AC cord 3YS4011-1026P1	3YS4011-1051P1	Correction	
9-2	21		Release link A 4PB4043-1962P1	3PB4043-1962P1	Correction	
	27	ML200-034	Adjusting lever 4PP4043-2083G1	4PP4044-1920G1	Change part	<div> <div>Old parts</div> <div> <div>New equipment</div> <div>New part</div> </div> </div>
	30		Semiautomatic sheet feed assy 4YX4044-1706G1	4YX4044-1922G1		

PARTS LIST CHANGE RECORD ML294 (2/3)

Table	Item	ECO No.	Old Part	New Part	Description	Compatibility
9-2	38		Carriage cover 2PB4044-1997P1	2PB4044-1697P1	Correction	
	49		Carriage frame	4PP4043-1942G2	Addition	
	50		Ribbon shift roller	4PB4043-1966P1	Addition	
	51		Contact pressure rubber	4PP4044-1620P1	Addition	
	52		Ribbon guide stud	4PP4043-1950P1	Addition	
	53		Slider	4PB4025-1088P1	Addition	
	54		Small pan head screw	⊕ P(SW + W) 3-8-HH	Addition	
	55		Small pan head screw	⊕ 3 - 4 -HH	Addition	
9-3	1	ML200-094	Centronics parallel interface module 4YA4042-1063G200 (ODA) 4YA4042-1063G201 (ODA) 4YA4042-1063G202 (ODA) 4YA4042-1063G203 (ODA) 4YA4042-1063G204 (ODG) 4YA4042-1063G205 (ODG) 4YA4042-1063G206 (ODG) 4YA4042-1063G207 (ODG)	4YA4042-1343G230 4YA4042-1343G231 4YA4042-1343G232 4YA4042-1343G233 4YA4042-1343G234 4YA4042-1343G235 4YA4042-1343G236 4YA4042-1343G237	27256ROMs are changed to 27512 ROM.	The new and old ROMs are able to mount Personality module REV. 3, PCB ver. 6 or later.

PARTS LIST CHANGE RECORD ML294 (3/3)

Table	Item	ECO No.	Old Part	New Part	Description	Compatibility
9-4	1	ML200-094	RS-232-C serial interface module 4YA4042-1064G200 (ODA) 4YA4042-1064G201 (ODA) 4YA4042-1064G202 (ODA) 4YA4042-1064G203 (ODA) 4YA4042-1064G204 (ODG) 4YA4042-1064G205 (ODG) 4YA4042-1064G206 (ODG) 4YA4042-1064G207 (ODG)	4YA4042-1344G230 4YA4042-1344G231 4YA4042-1344G232 4YA4042-1344G233 4YA4042-1344G234 4YA4042-1344G235 4YA4042-1344G236 4YA4042-1344G237	27256 ROMs are changed to 27512 ROM.	The new and old ROMs are able to mount Personality module REV. 3, PCB ver. 4 or later.
9-5	1		RS-422-A serial interface module 4YA4042-1067G200 4YA4042-1067G201 4YA4042-1067G202 4YA4042-1067G203 4YA4042-1067G204 4YA4042-1067G205 4YA4042-1067G206 4YA4042-1067G207	4YA4042-1346G230 4YA4042-1346G231 4YA4042-1346G232 4YA4042-1346G233 4YA4042-1346G234 4YA4042-1346G235 4YA4042-1346G236 4YA4042-1346G237	27256 ROMs are changed to 27512 ROM.	The old and new ROMs are able to mount Personality module REV. 3, PCB ver. 3 or later.

App. I

DESCRIPTION OF OPERATION

APPENDIX I. DESCRIPTION OF OPERATION

1. General Outline

The major component parts of the ML294 printer are the control section and the printing mechanism. The control section consists of power supply section, main control board, and interface module, and printing mechanism consists of a print head, spacing mechanism, line feed mechanism, and ribbon color change/ribbon feed mechanism.

1.1 Control Section

- (1) Power supply section
+5 V, +35 V, and ± 9 V DC voltages are generated from the AC input voltage.
- (2) Main control board
Overall control of the printer is handled by two micro-processors via peripheral LSI, memory, and other circuits. The motor drive circuits and head overdrive circuit are also mounted on this printed circuit board.
- (3) Personality module package
The personality module package copes with printer variation by combination of programmable ROMs with the three types of printed circuit board which differ in hardware specifications depending on the type of interface.

1.2 Printing Mechanism

- (1) Printhead
Printing operations are executed by 18 wires. Dot patterns are formed in the control section.
- (2) Spacing system
Spaces, tabs, and carriage returns are executed when the carriage is driven by the space motor mounted in the carriage section.
- (3) Line feed system
Line feed operations are executed by stepping motor for both single and continuous paper forms.
- (4) Ribbon color change/ribbon drive system
Ribbon feed is driven by stepping motor rotation. The ribbon cartridge is shifted up and down to change the ribbon color by reversing the motor rotation.

2. Circuit Description

2.1 Circuit Components (see block diagram in Figure A-1)

2.1.1 Main control board

- (1) Microprocessors (Q13: 8032, Q16: 8031BH1 or M80C51F)
The microprocessors (MPU) play a central role in the control circuit, giving directions to various peripheral circuits.
By using one of the two microprocessors as the master MPU (Q13) and the other as a slave MPU (Q16), printer processes are speeded up. The master MPU is mainly involved in control of slave MPU processing commands and interfacing, and the slave MPU is mainly involved in control of the spacing system and printing timing.
The I/O ports are used as address bus, data bus, and control lines.
- (2) Programmable ROM (Q12: 8K bytes ROM)
The control program for the slave MPU is in this ROM. The slave MPU is operated in accordance with this program to carry out the various control processes.
- (3) RAM (Q11: 2K bytes S.RAM)
The data involved in the various initialization settings is stored in this RAM which is backed up by a built-in battery when the power is off. (Battery life approximately 7 years.)
- (4) LSI (Q14: MSM60769)
This LSI is connected to MPU8032 and MPU8031 to provide the following functions.
 - (a) Master - slave MPU interfacing
Command data transferred from the master MPU buffer to the slave MPU is passed via a 3-byte FIFO buffer contained in this LSI. And data transferred from the slave to master MPU is passed via 1-byte register.
 - (b) Data memory bank switching
Three memory banks (bank 0 to bank 2) where the memory address is above 8000 (hex) are switched by command from the master MPU.
 - (c) Address latch
The eight lower order bits (A0 thru A7) of address are latched and used as the address when reading/writing from peripheral devices.
 - (d) Correction function of printhead drive timing
Dot print positions are corrected by changing the timing of printhead drive to print characters at the specified position in the selected print mode, corresponding to relation between the distance of dot-pins of the 18-pin parallel printhead in two rows and the print mode.

(5) LSI (Q15, MSM61048)

This motor control LSI handles the following functions.

- (a) Spacing motor speed control
Input of a command from the slave MPU results in acceleration/deceleration of the spacing motor. The spacing motor speeds for different printing modes are also controlled by this function.
- (b) Dot timing generation
An encoder (PHASE A & B) mounted in the spacing motor generates an MO LSI IPT signal synchronized with the printing position. This signal is also corrected by slave MPU and LSI (MSM60769, MSM60366) to provide dot-on timing.
- (c) I/O ports
The 12-bit output ports and 10-bit input ports are used for input of commands from MPU and resultant output of various control signals.

(6) LSIs (Q9, Q10 MSM60366)

These LSIs control the 18-pin parallel printhead and each of them controls drive timing of 9-pin of printhead. They are connected to MPU 8031 and have the following functions.

- (a) Distribution function of head-dot data
This function distributes the dot data to each printhead pin to drive the printhead pins in specified timing, when the print data and the LSI TRIG signal are input from the slave MPU.
- (b) Correction function for print pressure of printhead
Print density dispersion caused by the difference of print pressure according to number of dots at simultaneously printing, is corrected by changing printhead driving time.
- (c) Generation function of line feed (LF) motor phase signal
4-phase signals used for driving the stepping motor in bipolar level, LF ϕ 1DV, LF ϕ 3DV or LF ϕ 3DV and LF ϕ 4DV are generated, when 2-phase signals, LF ϕ 1 / ϕ 3 or LF ϕ 2 / LF ϕ 4 are input from the master MPU.

2.1.2 Interface Module

(1) LSI (Q7: MSM 60360)

This LSI is mainly used in control of external interfacing. The main functions are described below.

(a) Parallel interface and serial interface control

Parallel and serial interface modes are set by the LSI RS/Centronics pin (pin 34) for control of the respective modes.

(b) D-RAM refresh control

(2) Programmable ROM (Q1)

The control program for the master MPU is stored in these ROMs. The master MPU is operated in accordance with this program to carry out the various control processes.

(3) CG ROM (Q2)

Storage of various character fonts.

(4) RAMs (Q5, Q6: 16K bytes D.RAM)

Used as control working registers, printing buffers, and receiving buffers.

(5) Line driver/receiver

SN75154 Line receiver conforming with RS-232-C ratings.

SN75188 Line driver conforming with RS-232-C ratings.

AM26LS32 Line receiver conforming with RS-422-A ratings.

AM26LS31 Line driver conforming with RS-422-A ratings.

(See Functional Specifications for details on these ratings.)

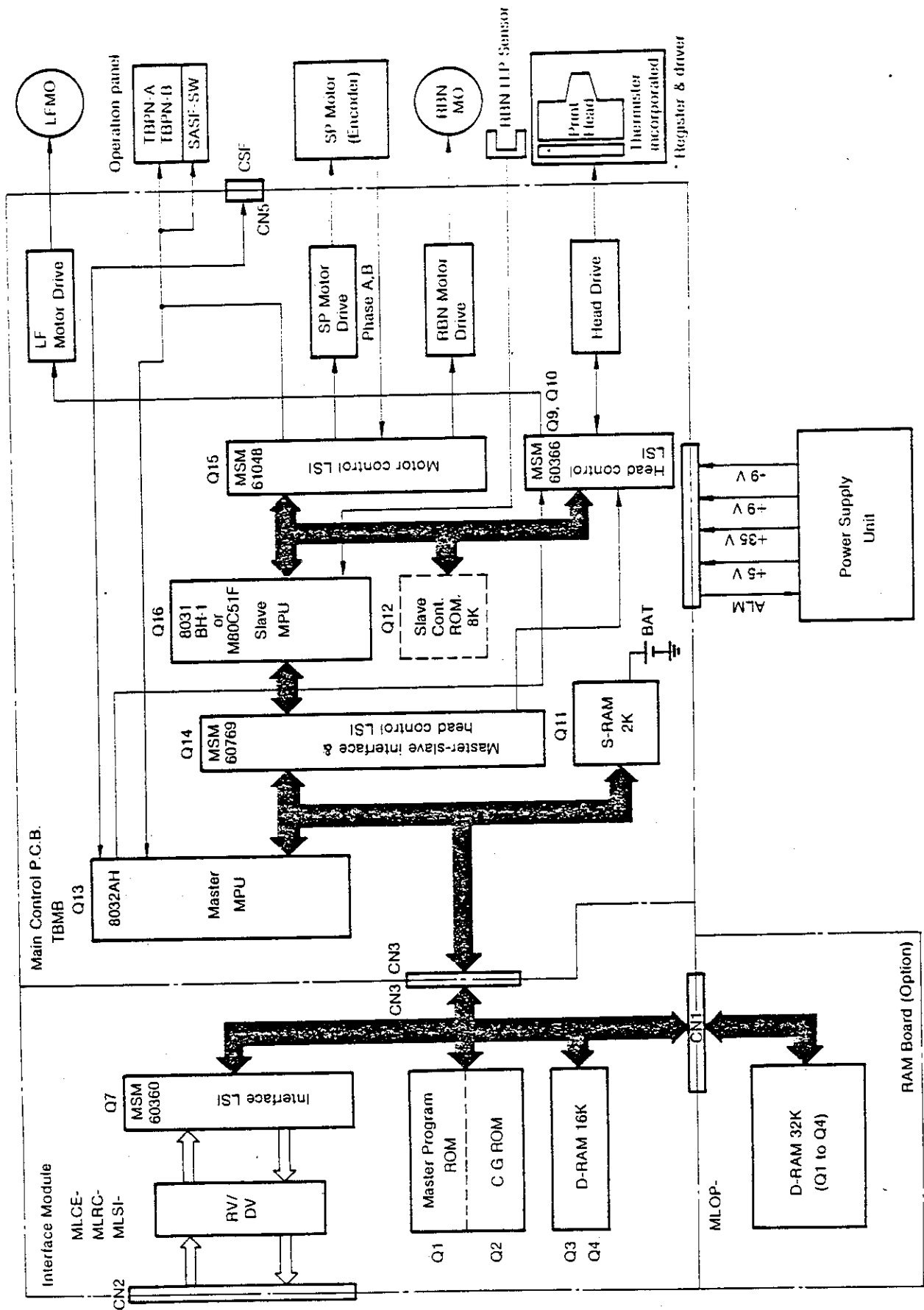
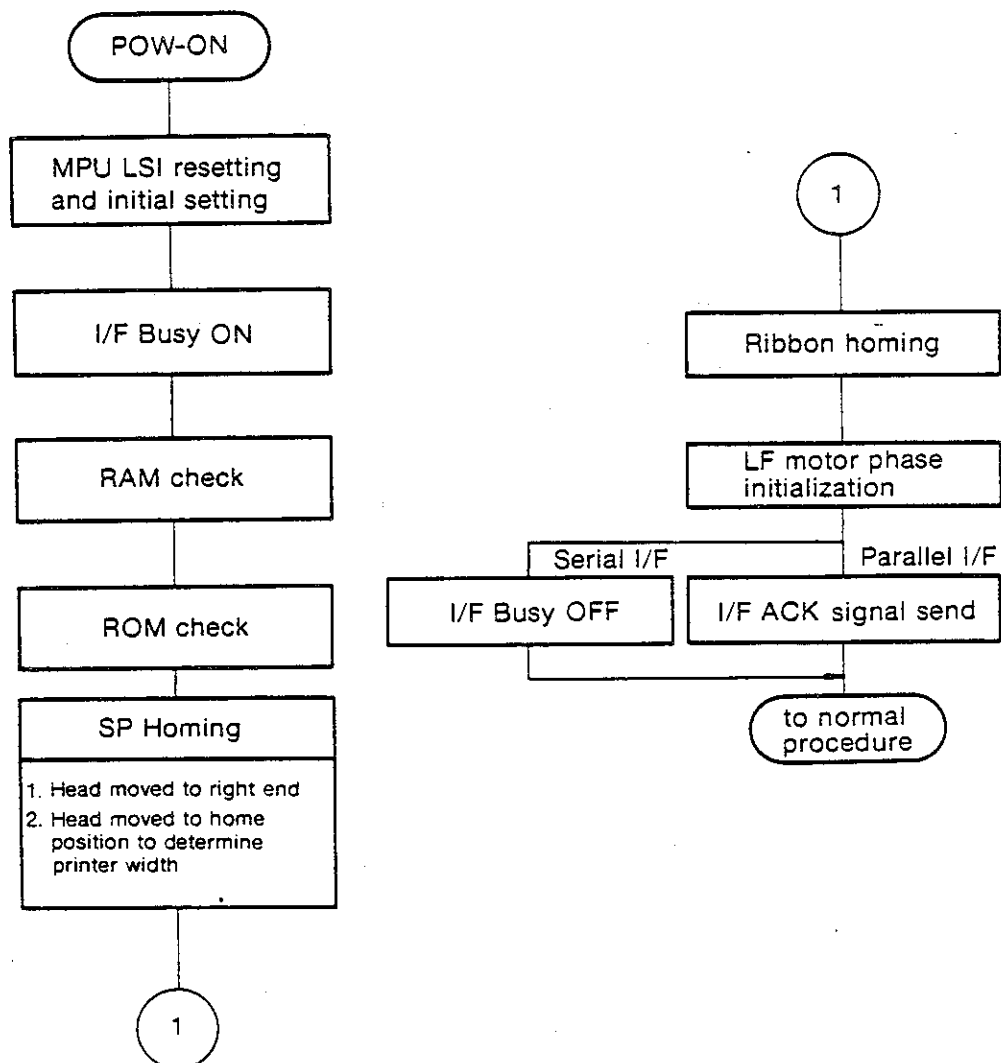


Fig.A-1 Block diagram

2.2 Description of Circuit Operations

2.2.1 Initialization

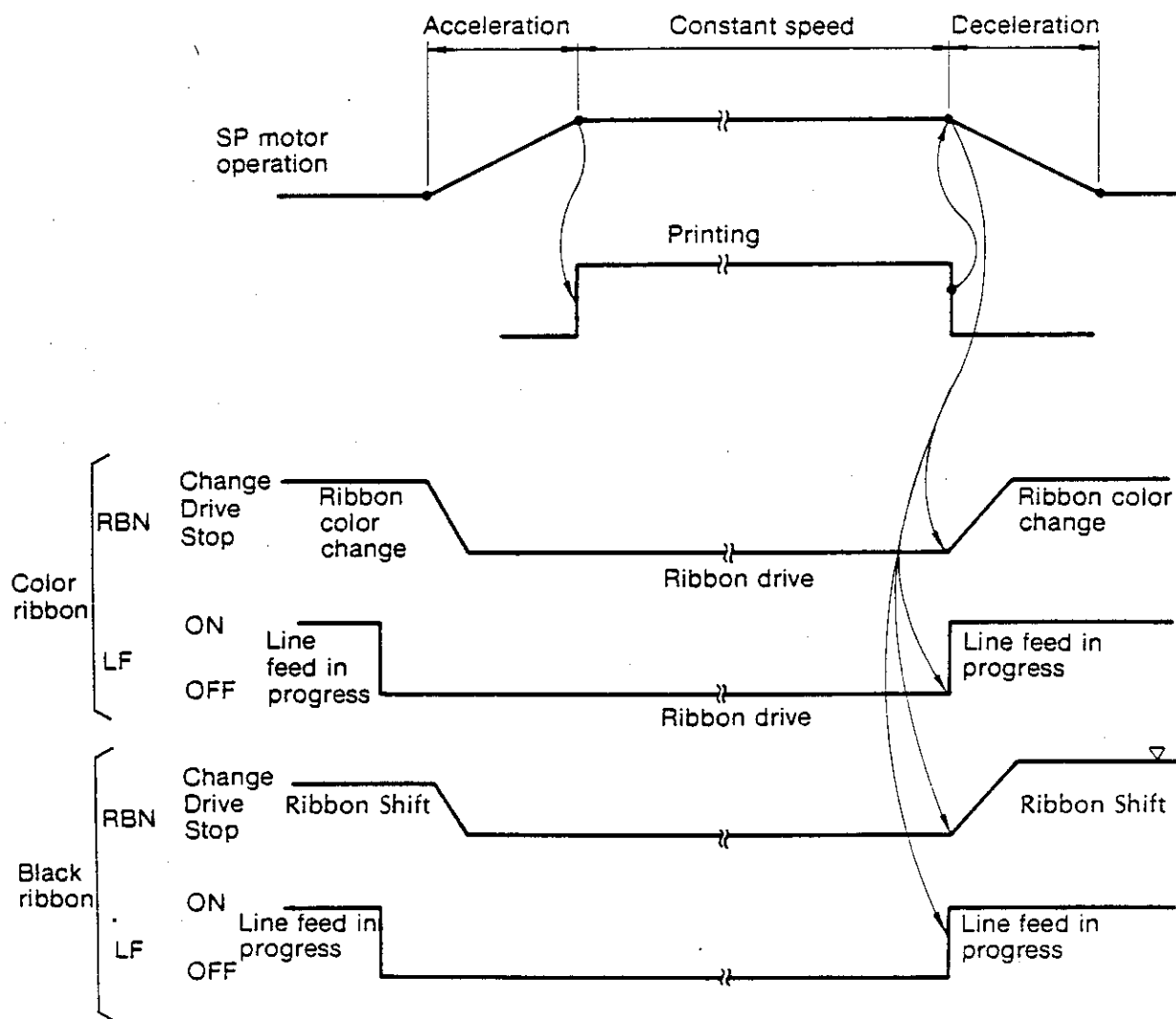
The ML294 printer is initialized when the power is switched on, or when a parallel I/F I-PRIME signal is applied from the host computer. Initialization is achieved by output of a RSTOUT signal from the reset circuit (pin 9 of Q13), followed by resetting of Q13 (master MPU), Q16 (slave MPU), Q14 (master-slave I/F MPU), Q15 (motor control LSI), Q9, Q10 (HEAD control LSI), and Q7 (interface LSI) on the interface module. Completion of this resetting process is followed by program execution. The program executed in this case handles mode setting of the Q7, Q9, Q10, Q14 and Q15 LSIs and the two MPUs (Q13 and Q16), memory (ROM/RAM) checking, RAM initialization, and carriage homing. Then at the same time that the interface signals are set (P-I/F: ACK signal send S-I/F: BUSY Singal OFF), the SELECT lamp comes on to inform the host computer that initialization has been completed and that the printer is ready to receive data (that is, that the pritner is in data receive standby mode).



2.2.2 Printing Operations

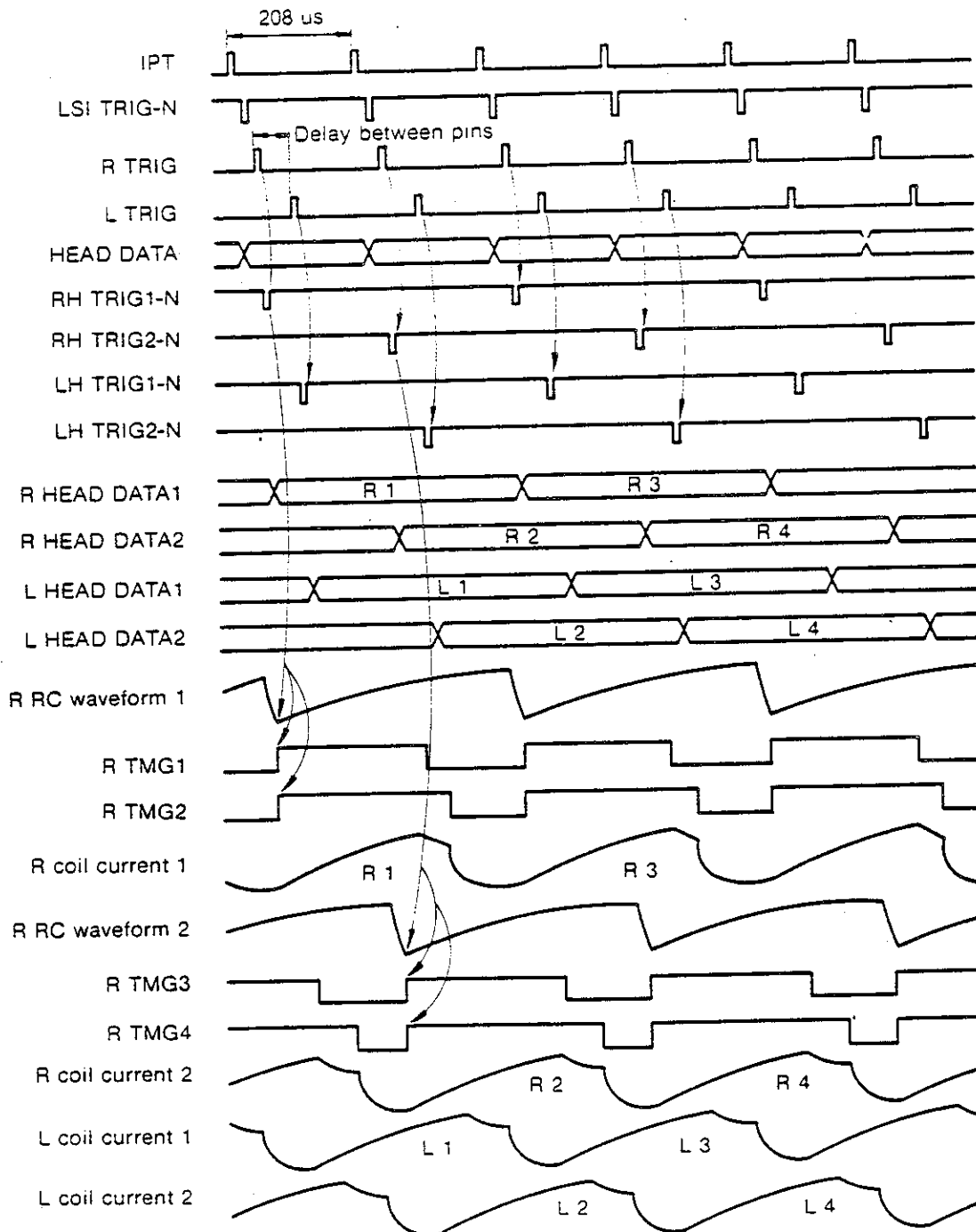
Spacing, printing, line feed, and ribbon color change/drive operations are controlled in the following way.

When a spacing motor operation command is received from the master MPU (8032), the slave MPU (8031) activates the spacing motor as well as commencing ribbon feed. Once the spacing motor has been accelerated to constant speed, printing is started. And after the printing has been completed, an LF start command is passed to the master MPU when the spacing motor shifts into deceleration mode. At the same time that LF operation is started by the master MPU, a ribbon color change command is passed to the slave MPU. And before that LF operation is completed, the next spacing motor operation command is sent to the slave MPU from the master MPU. Printing is executed by repetition of this control process.



2.2.3 Printhead Drive Circuit

This circuit is used to drive head magnets corresponding to HEAD DATA 1 to 18 (head pins) by the RH TRIG1-N, RH TRIG2-N, LH TRIG1-N and LH TRIG2-N for printing purposes. When the RH TRIG1-N, RH TRIG2-N, LH TRIG1-N and LH TRIG2-N signals are at "H" level, the head driving time is determined by a CR integrating circuit. This circuit automatically compensates the printing voltage in response to changes in the number of magnets to be driven. That is, the drive time is lengthened if a larger number of magnets is to be driven, but shortened if there are less magnets to be driven.



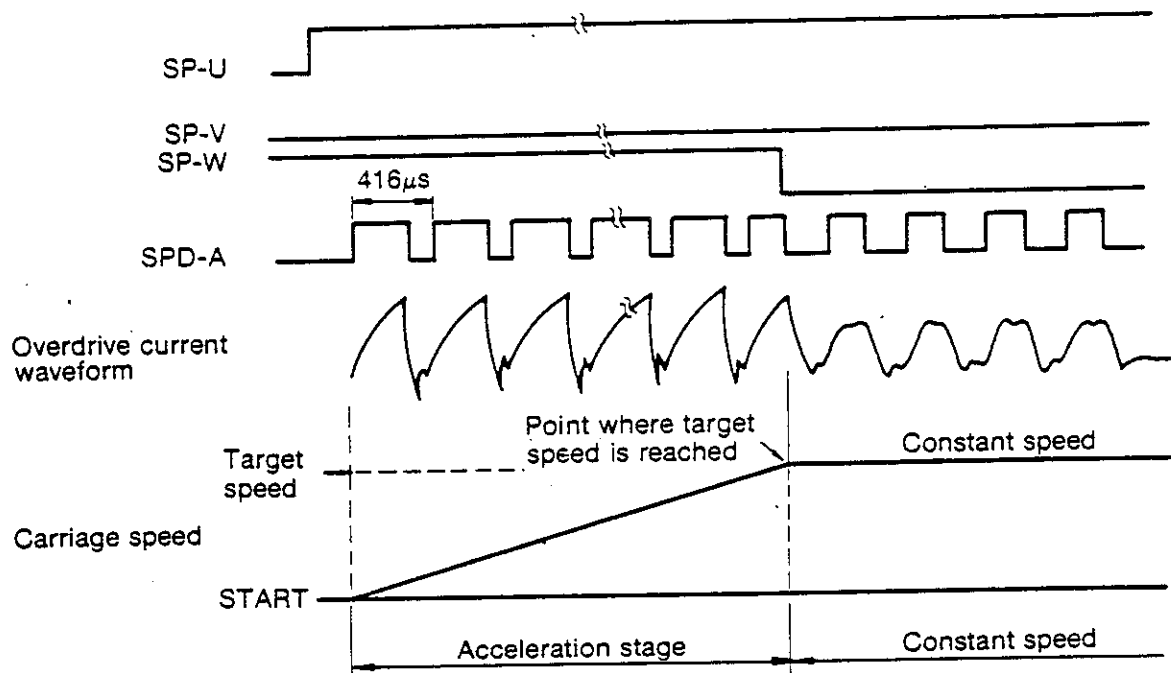
2.2.4 Spacing

(1) Space motor control

When the motor control LSI (Q15: MSM61048) receives a spacing command from the slave MPU, it generates space motor phase signals (SPU, SPV, SPW) and an overdrive signal (SPD-A).

This SPD-A signal is of a fixed cycle pulse where the pulse width can be specified by program, and is used in control of the motor drive time.

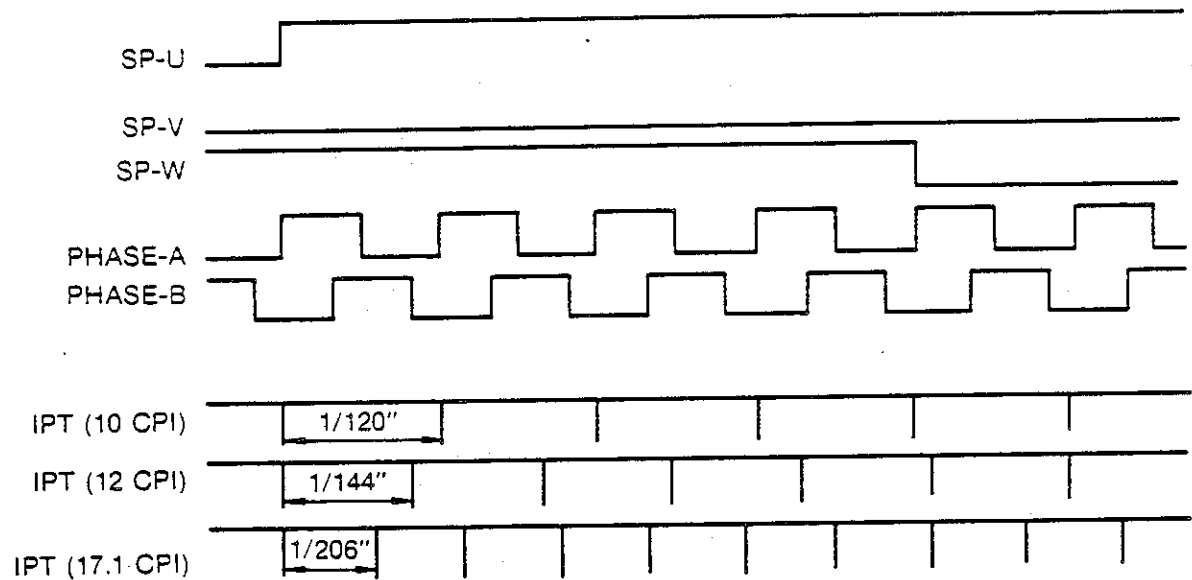
The motor driver (Q1: MTDV) drives the space motor upon reception of these signals. Pins 9 and 11 of MTDV are used for overvoltage and overcurrent protector circuits.



(2) Slit encoder

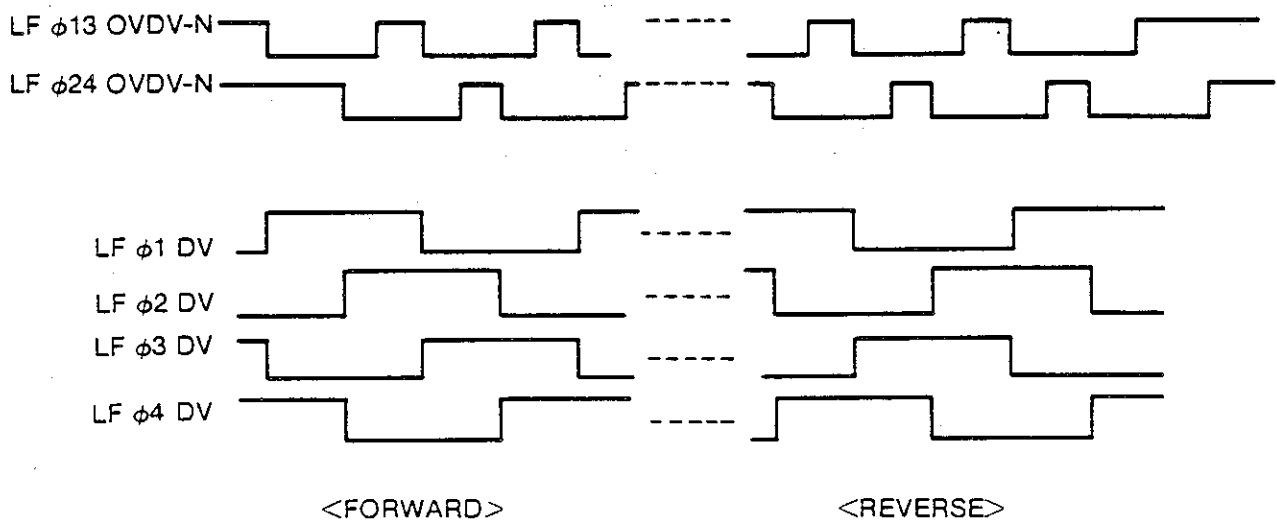
Space motor operation is accompanied by output of PHASE-A and PHASE-B signals generated by a photosensor and slitted disk.

The motor control LSI (Q15: MSM61048) divides the edge pulse in accordance with the printing pitch to generate an MO LSI IPT signal used for dot-on timing and carriage position detection timing.



2.2.5 Line Feed

The LF motor is locked by an +9V voltage when stopped. And during line feed operations, a +35 V voltage is applied by the LF $\phi 13$ OVDV-N, LF $\phi 24$ OVDV-N signal.

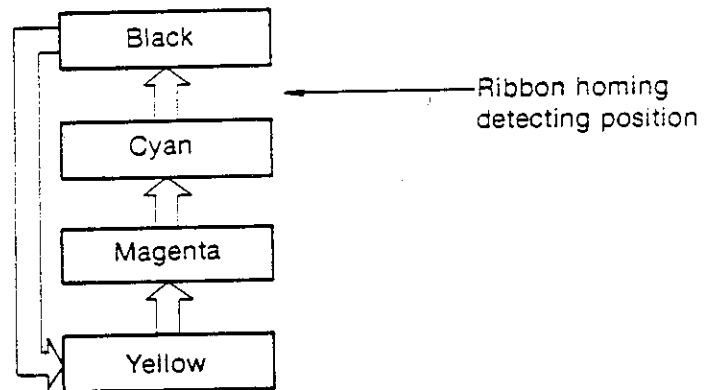


2.2.6 Ribbon Color Change / Ribbon Feed

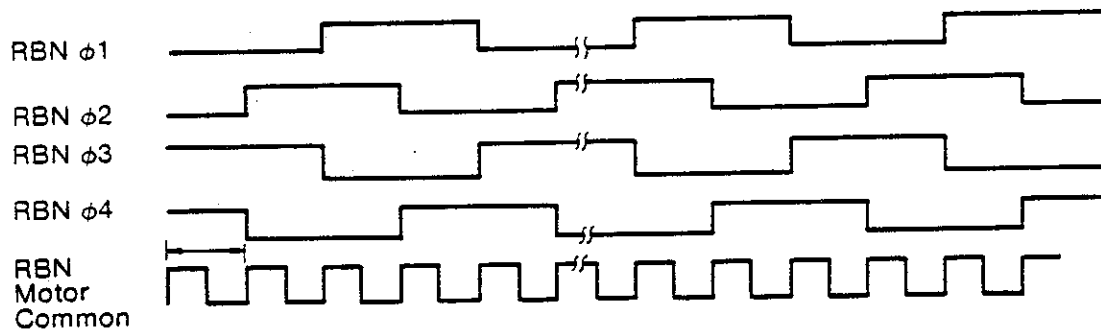
Ribbon feed is achieved by clockwise drive of the ribbon motor. Counter clockwise drive of this motor results in change of the ribbon color.

(The ribbon motor rotation direction is as seen in the ribbon drive assembly (L) from the center of the printer.)

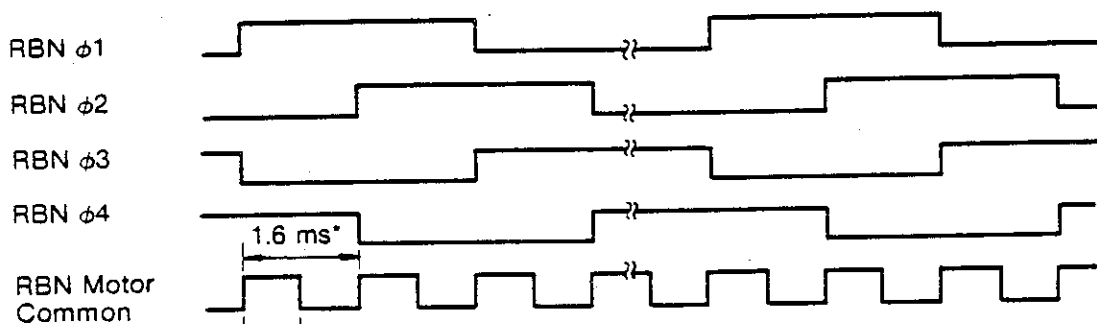
(1) Ribbon color change direction



(2) Ribbon motor drive (color change)



(3) Ribbon motor drive (feeding)



0.8 ms*

* 2.4 ms when the print head is shifted in the reverse direction.

2.2.7 Alarm circuit

(1) Abnormal drive circuit detector alarm

This circuit is designed to protect other circuits in the printer from possible damage by turning the power switching transistor off if an abnormal condition occurs in the print head, space motor, ribbon motor, LF motor drive circuit, or peripheral circuits.

This circuit monitors the drive time by the H ALM to H ALM9, HEAD O ALM, SPALM, RBNALM, and LFALM signals connected to the overdrive signal in each driver circuit. If the drive time in any of the driver circuits exceeds the prescribed time, and **ALM** signal ("L" level) is generated and the power switching transistor is turned off, thereby disconnecting all output voltages.

(2) High head temperature alarm

A thermistor built into the head is used to monitor head temperature and protect the head coil.

The head temperature gradually increases when heavy duty printing is continued for long periods of time. If a certain temperature (approximately 100° to 110°C) is reached, high head temperature alarm 1 is detected. As a result, the printer prints in a single direction intermittently. If alarm 2 is then detected, printing is temporarily stopped (6 to 7s) to let the head temperature fall before normal printing is resumed.

Detection of these alarm conditions involves reduction of resistance in the thermistor as a result of increase in head temperature. The (+) input potential of the comparator (Q5) subsequently falls and the comparator is inverted, resulting in output of **HEAD TEMP** signals to one of the microprocessors. The microprocessor in turn changes the comparator slice level by the TEMP LEVEL signals, and subsequently proceeds with decisions on high head temperature alarms 1 and 2.

(3) Paper end detector circuit

When the printer runs out of paper, a photosensor (PE) on the main control board is turned off, and the **PE** signal is changed to "L". When this signal is subsequently read by microprocessor, printing is stopped, and the **ALARM** lamp comes on.

(4) Cover-open detection

When the cover opened, the circuit of Hall sensor on the operation panel becomes OFF and **COV OPEN** signal becomes "High".

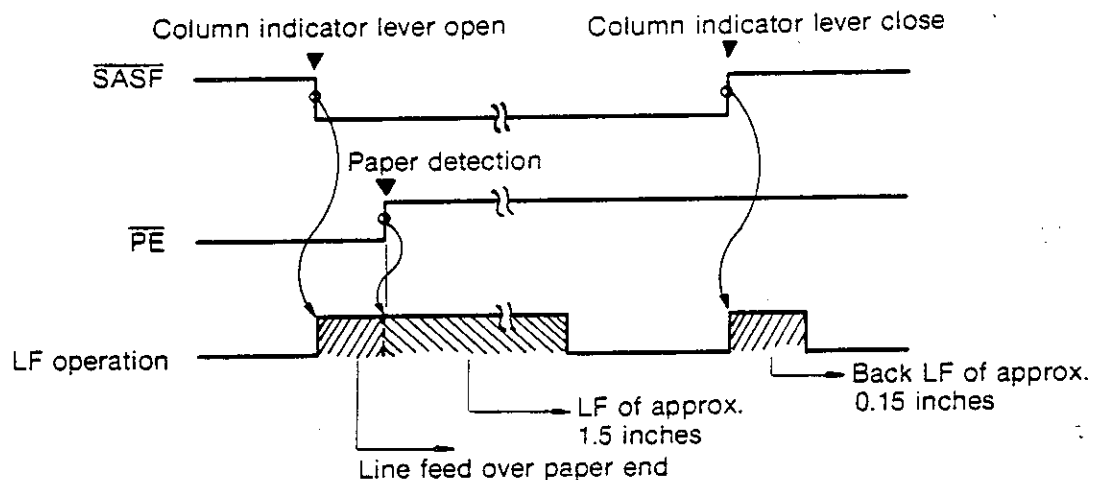
When this signal is transmitted to the MPU, printing will be stopped and **ALARM** lamp will light.

2.2.8 Semi-automatic sheet feed (SASF)

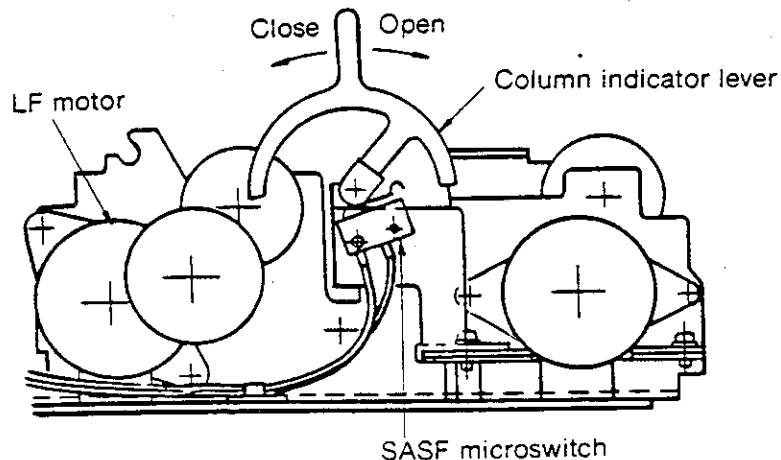
The print start position of a cut sheet will be automatically set by this function when resetting it after detection of the paper end.

The operation procedure is as follows:

- (1) A sheet is inserted from the rear of the platen after detecting paper end.
- (2) Throw the column indicator lever forward to set the open state and make the microswitch on.
- (3) The LF(line feed) operation is started and the sheet is fed over the paper end.
- (4) The sheet is continuously fed to approximately 1.5 inches over the paper end.
- (5) When the column indicator lever is returned to the former position, back LF (line feed back) of approximate 0.15 inches length is executed. Then the position of approximately 1 inch from the top of the sheet becomes a start line of printing.

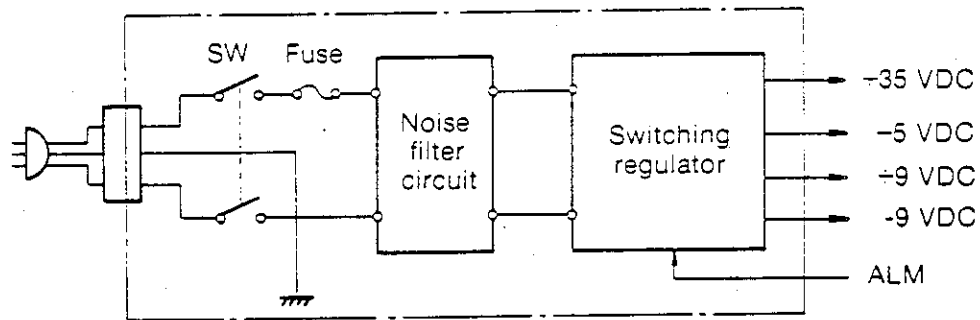


When the column indicator lever becomes the open state, drive pulses equivalent to the paper feed quantity are sent to the LF motor. When sheets are not inserted after ending the LF motor drive, the SASF operation becomes invalid and the ordinary paper end operation will be executed.



2.2.9 Power Supply Unit

The power supply unit is a switching type supply unit consisting mainly of a noise filter and switching regulator.

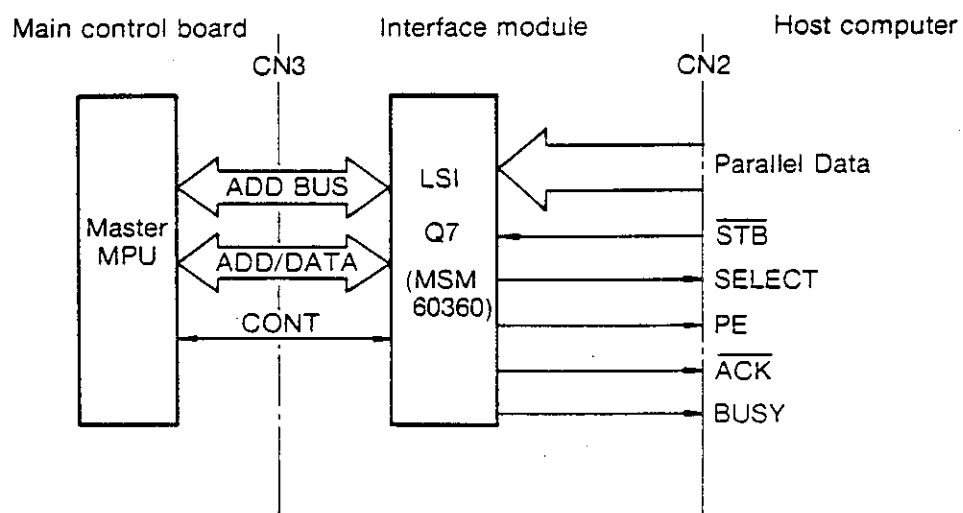


The function of the noise filter is to block noise generated externally, and to suppress noise generated in the printer. The switching regulator is used to generate constant DC voltages for the following purposes.

Voltage	Purpose
+5 V	Logic IC and LED driving
+9 V	Seerial interface line voltage, and LF and RBN motor holding voltage
-9 V	Serial interface line voltage
+35 V	Printhead, and SP, LF, and RBN motor driving

2.2.10 Centronics Parallel Interface

(1) Block diagram



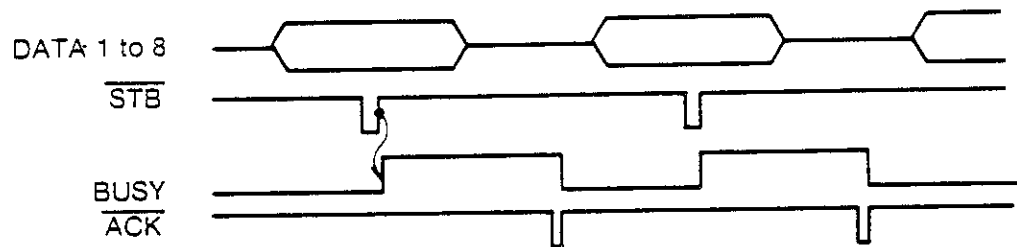
(2) Interface control

Data from the interface is passed in from connector CN2 and read at \overline{STB} signal timing by the interface LSI (Q7: MSM60360).

The BUSY signal remains ON while the data is being processed, and is turned off when the processing is completed, followed by output of the \overline{ACK} signal and request for the next item of data.

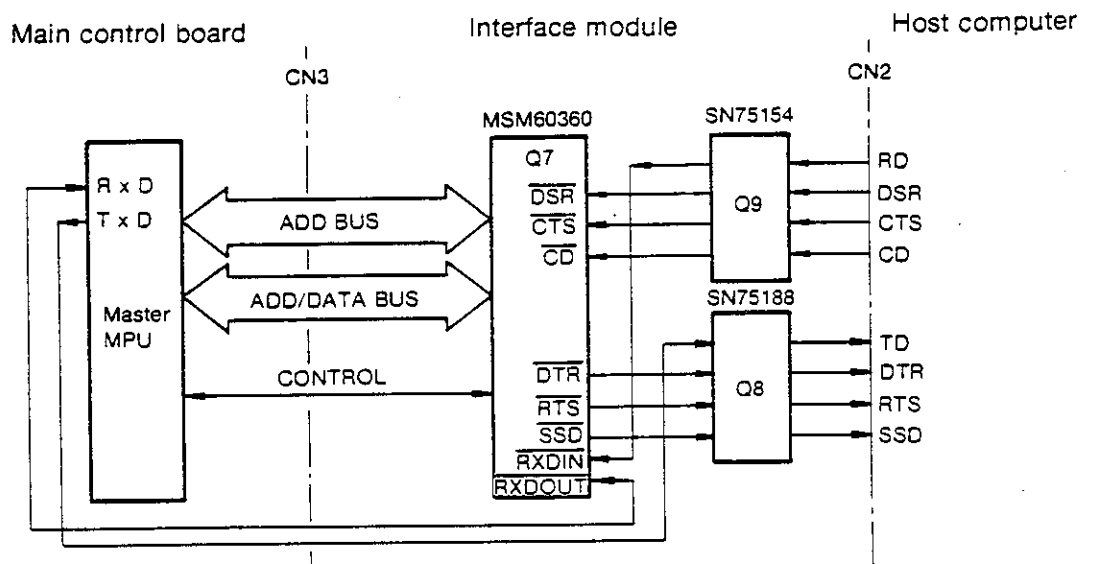
If data can no longer be received due to the receiving buffer being full, the BUSY signal is again generated, and notification is given that data transmission has been stopped.

(3) Receiving timing chart



2.2.11 RS-232-C Serial Interface

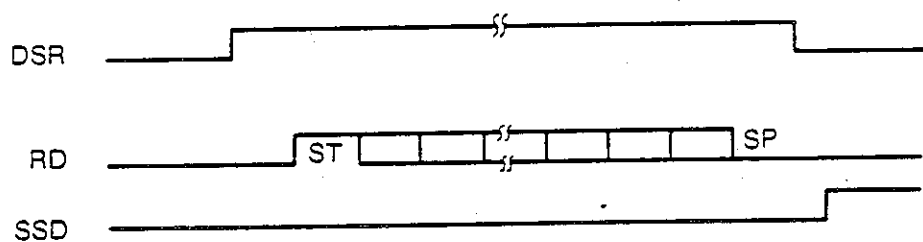
(1) Block diagram



(2) Interface control

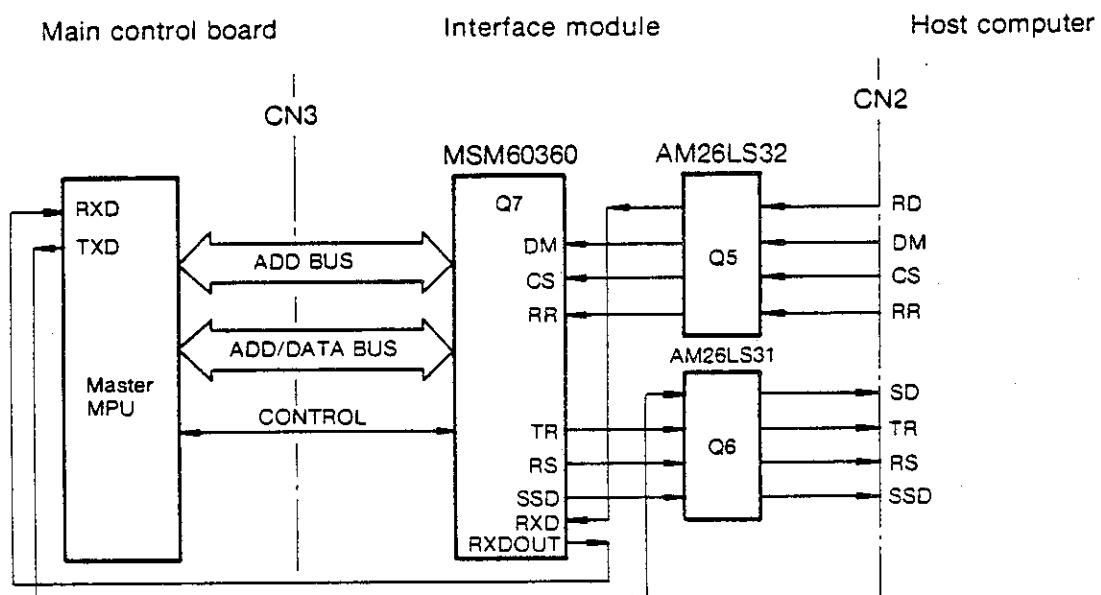
The RS-232-C interface signals (DSR, CTS, CD, and RD) are converted to TTL level signals by the line receiver (68) during reception, and are subsequently applied to the interface LSI (Q7). Input serial data is applied from pin 33 (RXDIN) of the LSI, and is passed via an internal latch to pin 44 (RXDOUT) to be received at the MPU serial port pin 10 (RXD). And the DTR, SSD, and RTS output signals from the interface LSI, and the TD data passed through pin 11 (TXD) of the MPU are converted to RS-232-C signal level by line driver (Q7) before being passed to the interface.

(3) Receiving timing chart



2.2.12 RS-422-A Serial Interface

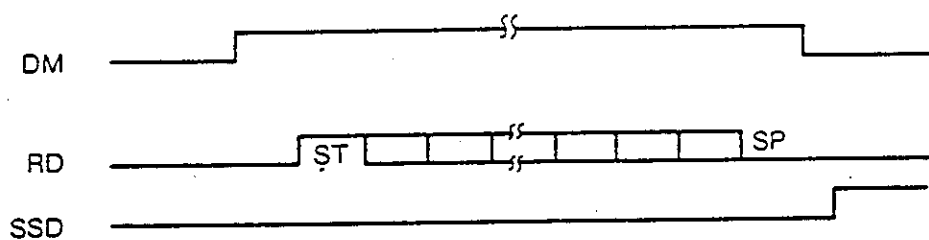
(1) Block diagram



(2) Interface control

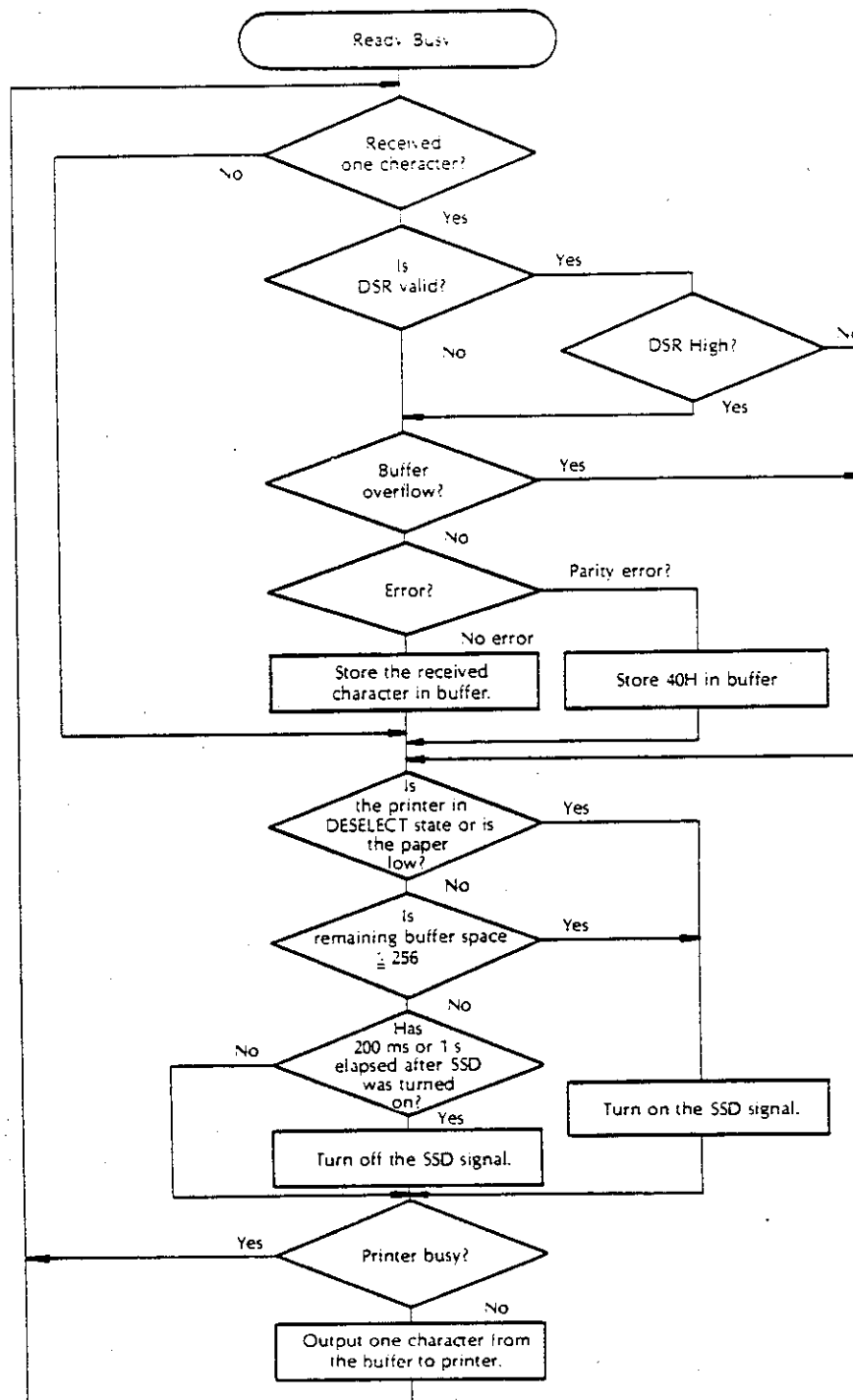
The RS-422-A interface signals (DM, CS, RP, and RD) are converted to TTL level signals by the line receiver (Q7) during reception, and are subsequently applied to the interface LSI (Q5). Input serial data is applied from pin 33 (RXD) of the LSI, and is passed via an internal latch to pin 44 (RXDOUT) to be received at the MPU serial port pin 10 (RXD). And the TR, SSD, and RS output signals from the interface LSI, and the SD data passed through pin 11 (TXD) of the MPU are converted to RS-422-A signal level by line driver (Q6) before being passed to the interface.

(3) Receiving timing chart

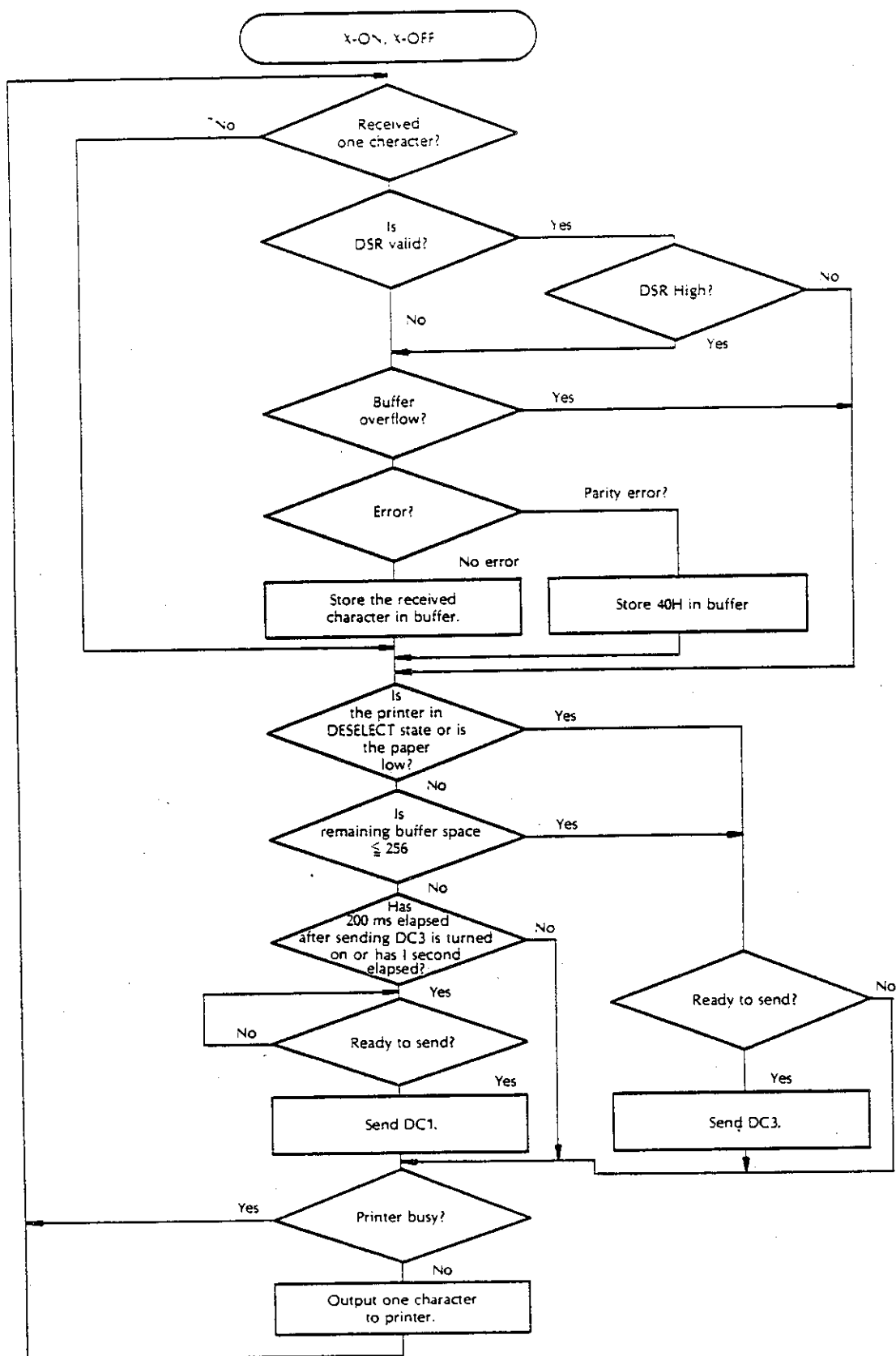


2.2.13 Communication Procedure Flow Charts

(1) Ready/busy protocol

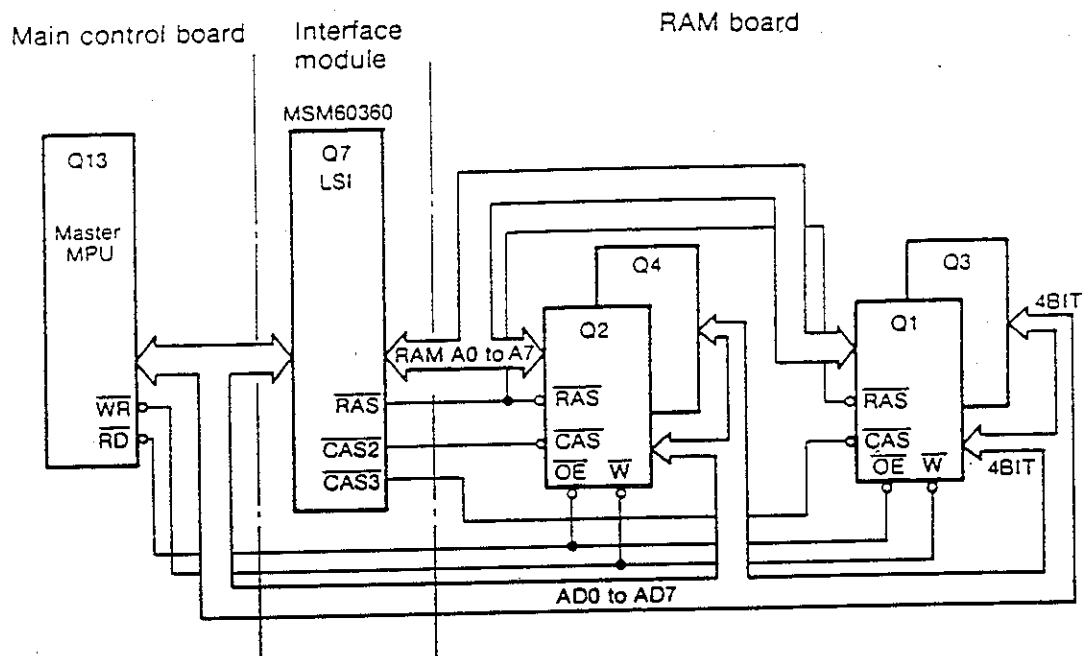


(2) X-ON/X-OFF protocol

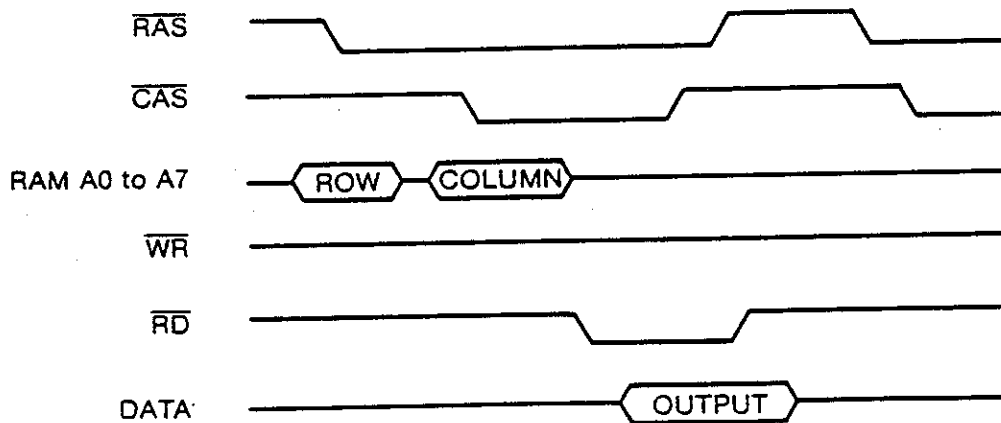


2.2.14 RAM Board (Optional)

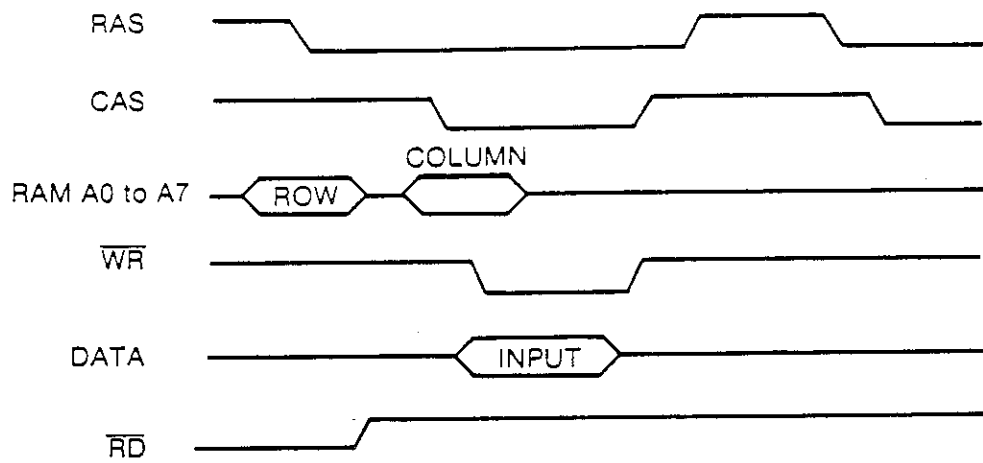
(1) Block diagram



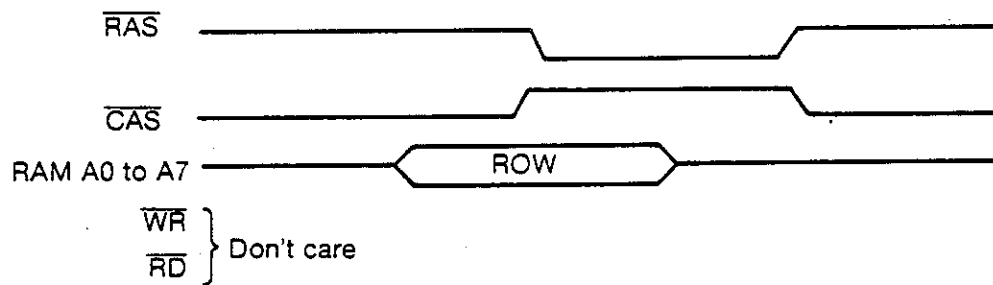
(2) Read timing



(3) Write timing



(4) Refresh timing



3. Description of Mechanisms and Operations

3.1 Printhead Mechanism and Operation

The printhead is a spring-charged head using a permanent magnet, and mounted on a carriage which moves parallel to the platen.

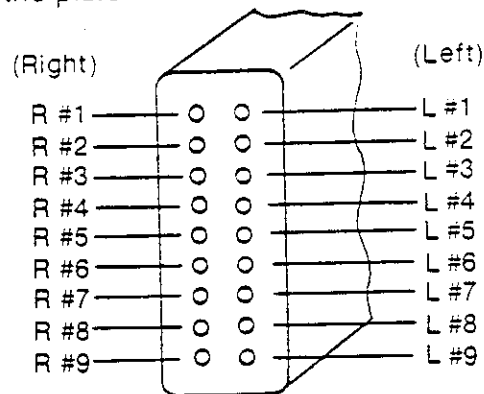


Figure A-2 The printhead(center)

(1) Printhead operation (See Figure A-3)

The armature is normally attracted to the core by the permanent magnet in opposition to the armature spring force. The print wires which are integrated with the armature are also in reset mode in this case. When the magnet coil is excited by a printing command from the DC section, magnetic flux is generated in the opposite direction to the flux of the permanent magnet, resulting in the armature being forced (by the armature spring) away from the core to make an impact on the platen through the ink ribbon and printing paper.

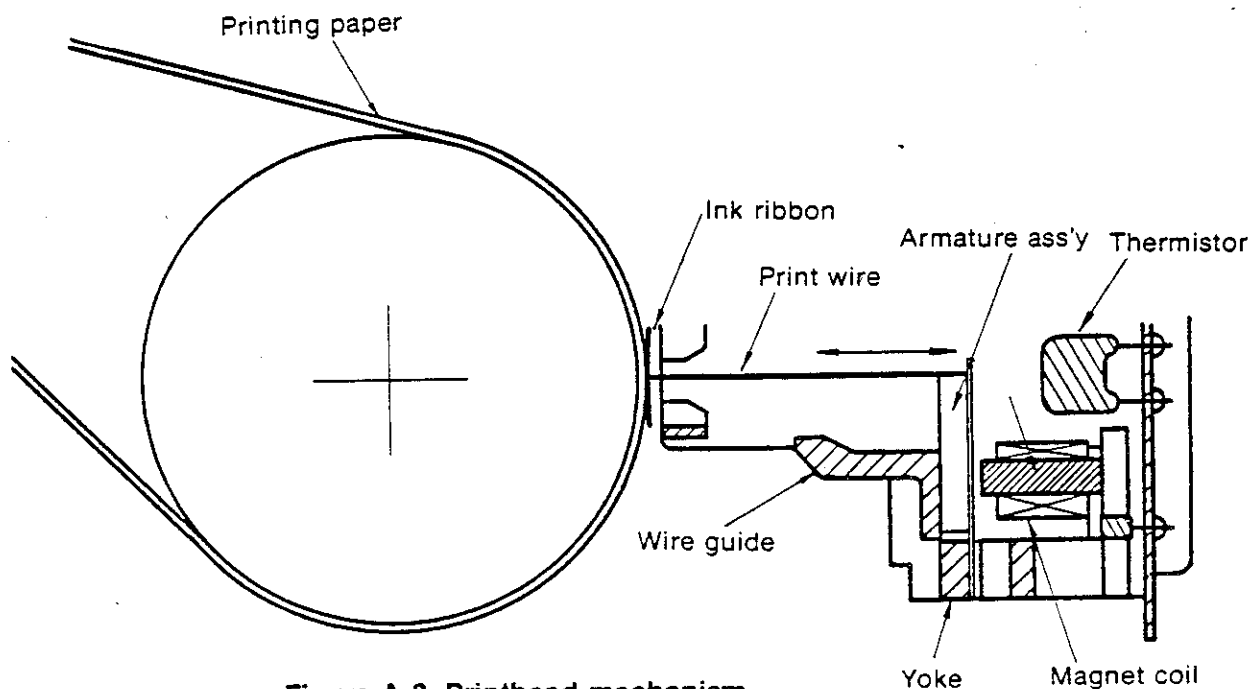


Figure A-3 Printhead mechanism

3.2 Spacing Mechanism and Operation

The spacing mechanism consists of the carriage shaft mounted parallel to the platen, and the carriage assembly and space motor assembly which move along that shaft. This mechanism is operated by a DC brushless motor mounted below the carriage frame. (See Figure A-4)

(1) Spacing operation

The carriage assembly where the print head and space motor assembly are mounted moves the carriage shaft parallel to the platen. When the space motor is activated, the driving power is transmitted to the motor gear. Since the motor gear is engaged with the space rack, the gear is rotated and moved laterally. That is, the entire carriage is shifted parallel to the platen.

As a result, the slitted disk is rotated together with the motor, and is passed through a slit sensor. The position of the carriage frame is determined by counting the number of slits detected by the slit sensor.

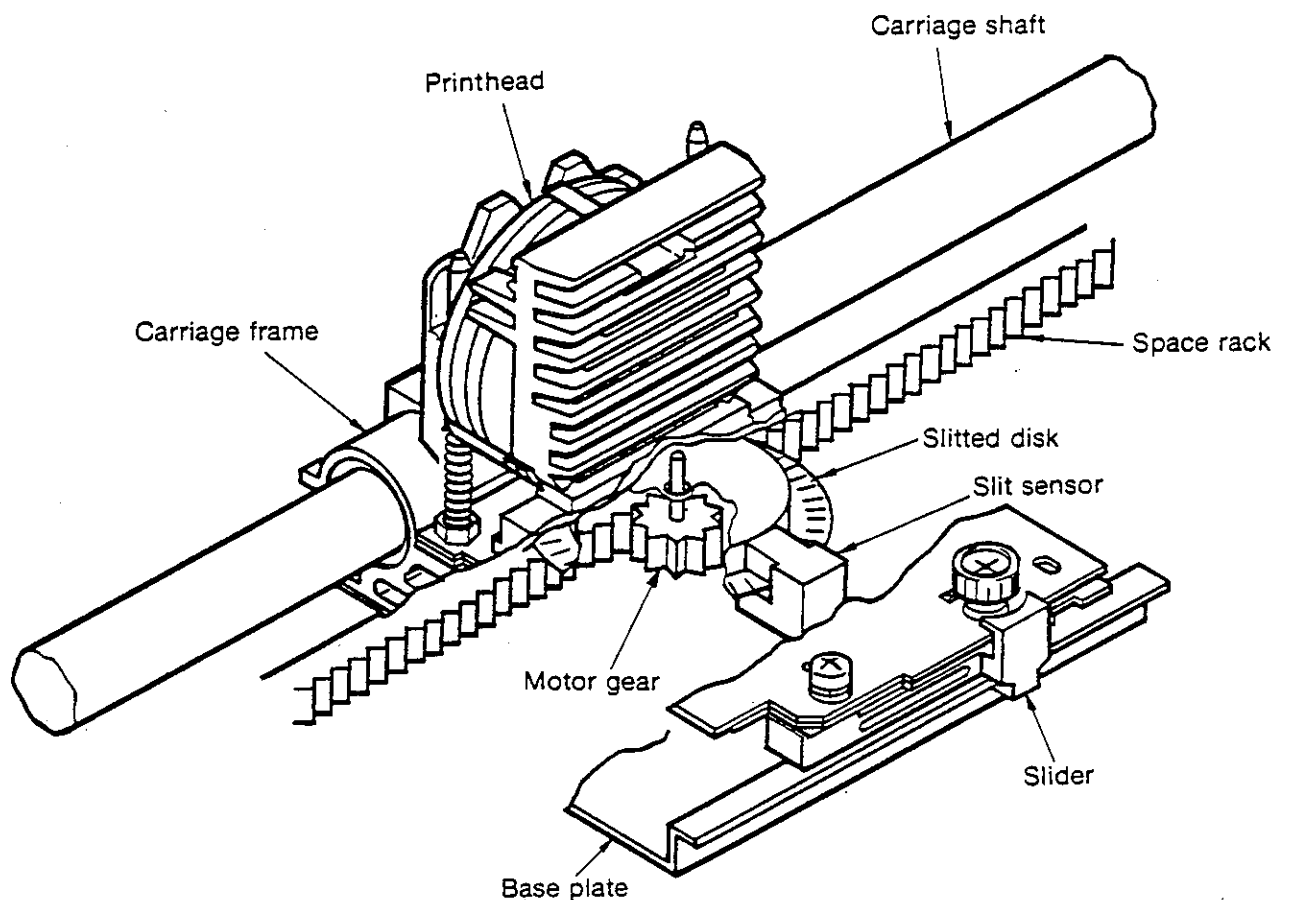


Figure A-4 Spacing mechanism

3.3 Head Gap Adjusting Mechanism

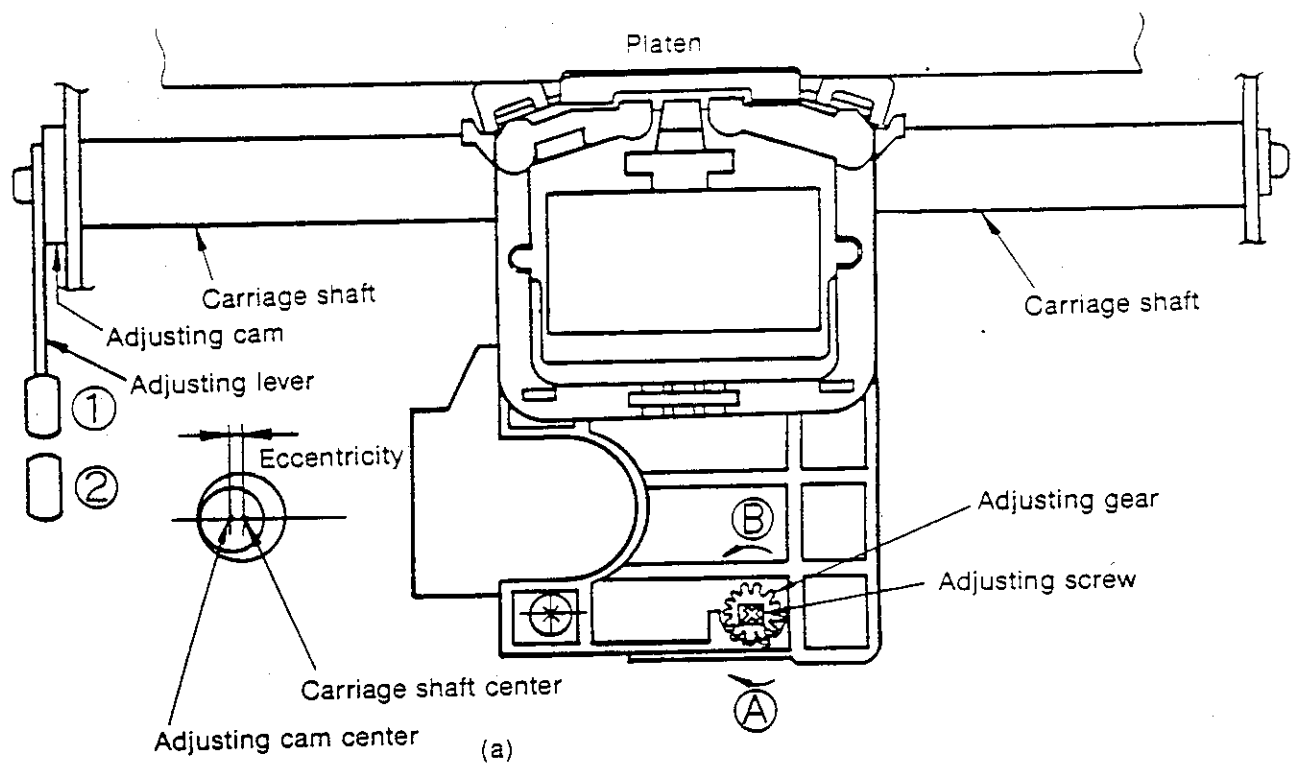
The head gap adjusting mechanism moves the printhead towards and away from the platen to match the thickness of the printing paper. This mechanism is divided into two types - one for maintenance personnel, and the other for the operator. (See Figure A-5)

(1) Adjusting mechanism for maintenance personnel

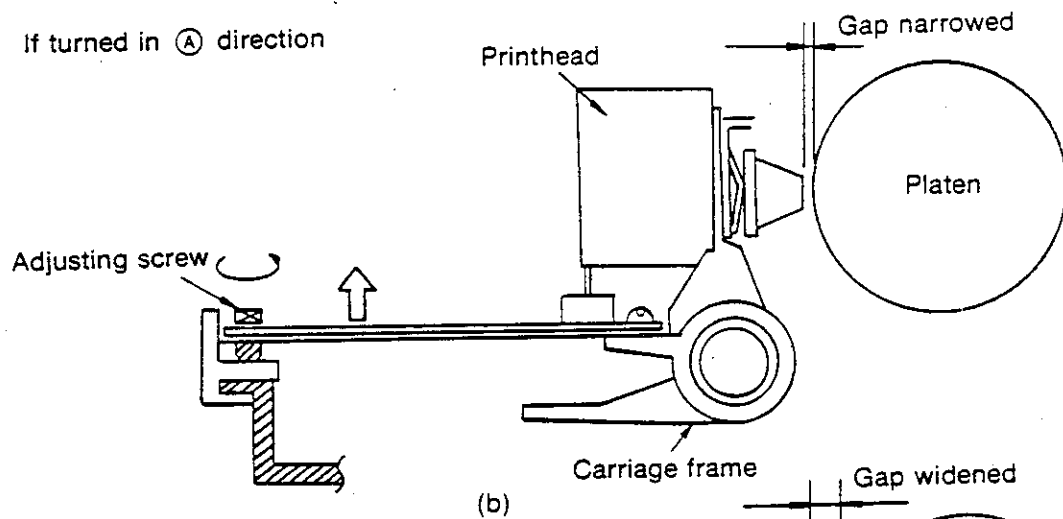
This mechanism consists of an adjusting gear, adjusting screw, and rack. If the adjusting lever is moved to position ①, and the adjusting gear is depressed while the adjusting screw is turned in either direction ④ or ⑤, the carriage frame is moved around the carriage shaft. (Note that the adjusting gear is rotated when the adjusting screw is turned.) As a result, the inclination of the printhead mounted on the carriage frame is changed, bringing the head closer to or further away from the platen. When the depressed adjusting gear is then released, that gear returns to its former height to engage the rack again.

(2) Adjusting mechanism for operator

The adjusting mechanism for the operator consists of the adjusting lever, carriage shaft, and adjusting cam. The carriage shaft and the adjusting cam are coupled in a non-coaxial arrangement, and the adjusting lever is connected to the adjusting cam. If the adjusting lever is moved to position ① or ②, the adjusting cam is turned, resulting in the carriage shaft being moved forward or backward. The distance between the printhead and the platen is thereby changed.



If turned in (A) direction



If turned in (B) direction

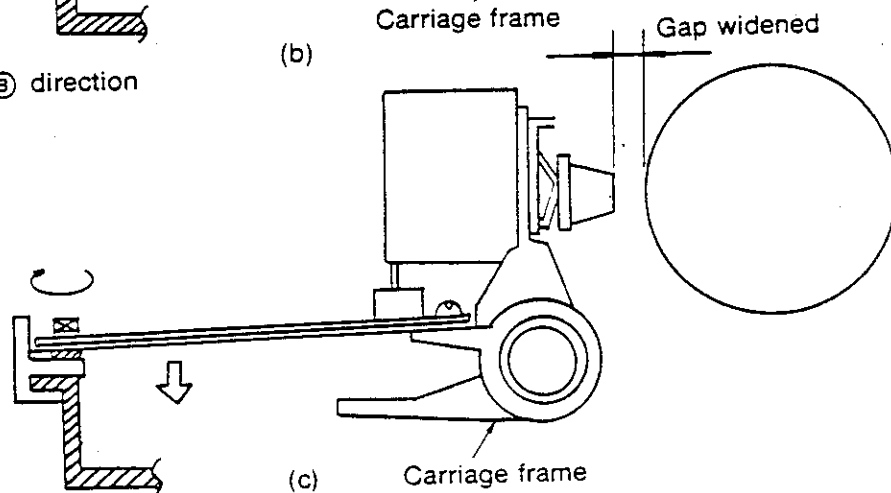


Figure A-5 Head gap adjusting mechanism

3.4 Ribbon Color Change / Ribbon Drive Mechanism

Ribbon color change and ribbon drive operations are handled by a single stepping motor. The ribbon drive and ribbon color change are executed by changing the rotation of the stepping motor. The motor itself is mounted on ribbon drive assembly (L).

(1) Ribbon color change mechanism

When the ribbon motor gear is turned counter clockwise (see Figure A-6), the planet gear engages the S gear (due to rotation of the ribbon motor) resulting in the ribbon change gear being rotated. At the same time, the ribbon shift cam is turned in the direction of the arrow. Resulting in the link connected to the cam being moved up and down. And the ribbon shift bracket where the ribbon cartridge (which moves in concert with the link) has been mounted is also moved up and down. Four different ribbon colors can thus be changed.

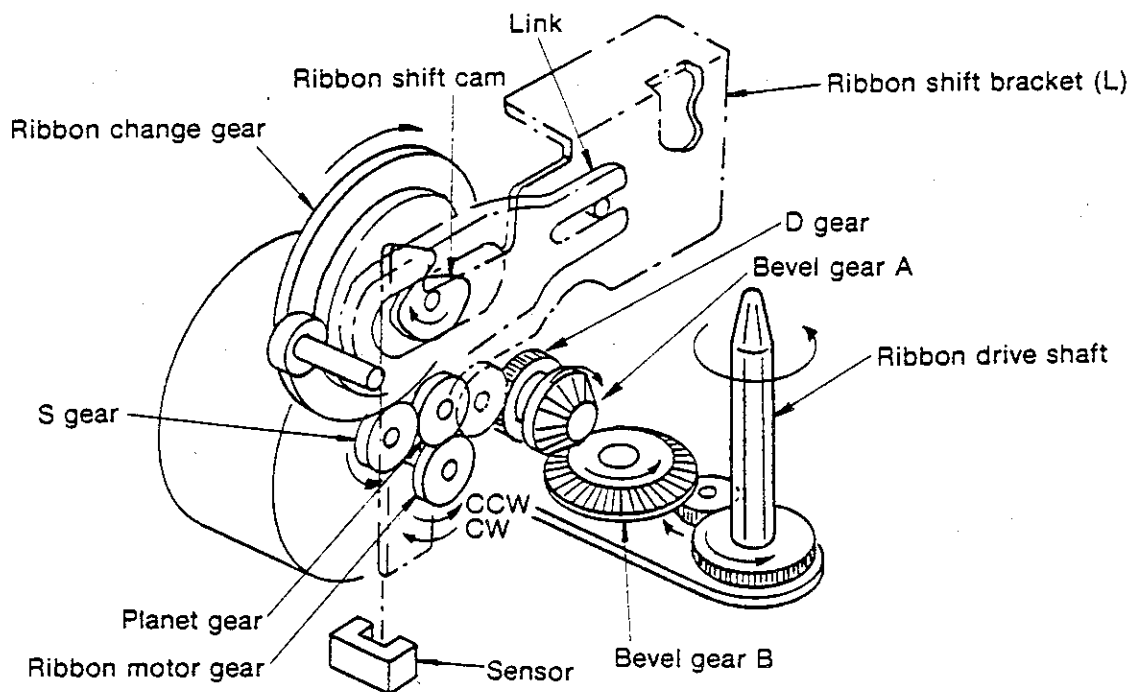


Figure A-6 Ribbon color change / drive mechanism

Figure A-7 shows the relationship between the rotational angle of the cam and the color ribbon and printhead positions. When the ribbon shift cam is turned, the color ribbon positions are changed in cycles (yellow to magenta to cyan to black, and then back to yellow again) in respect to the printhead. This cyclic operation can be stopped at any specified color.

The position where the end of the ribbon shift bracket is detected (between black and cyan) by the ribbon home sensor is the home position for the ribbon. The purpose of this home position is to correct the amount of rotation in the ribbon motor (at this position) so as to prevent accumulation of error in ribbon change operations in following cycles. Immediately after the power is switched on, the ribbon shift bracket is moved to a position a little ahead of this home position at a printing position for black ribbon.

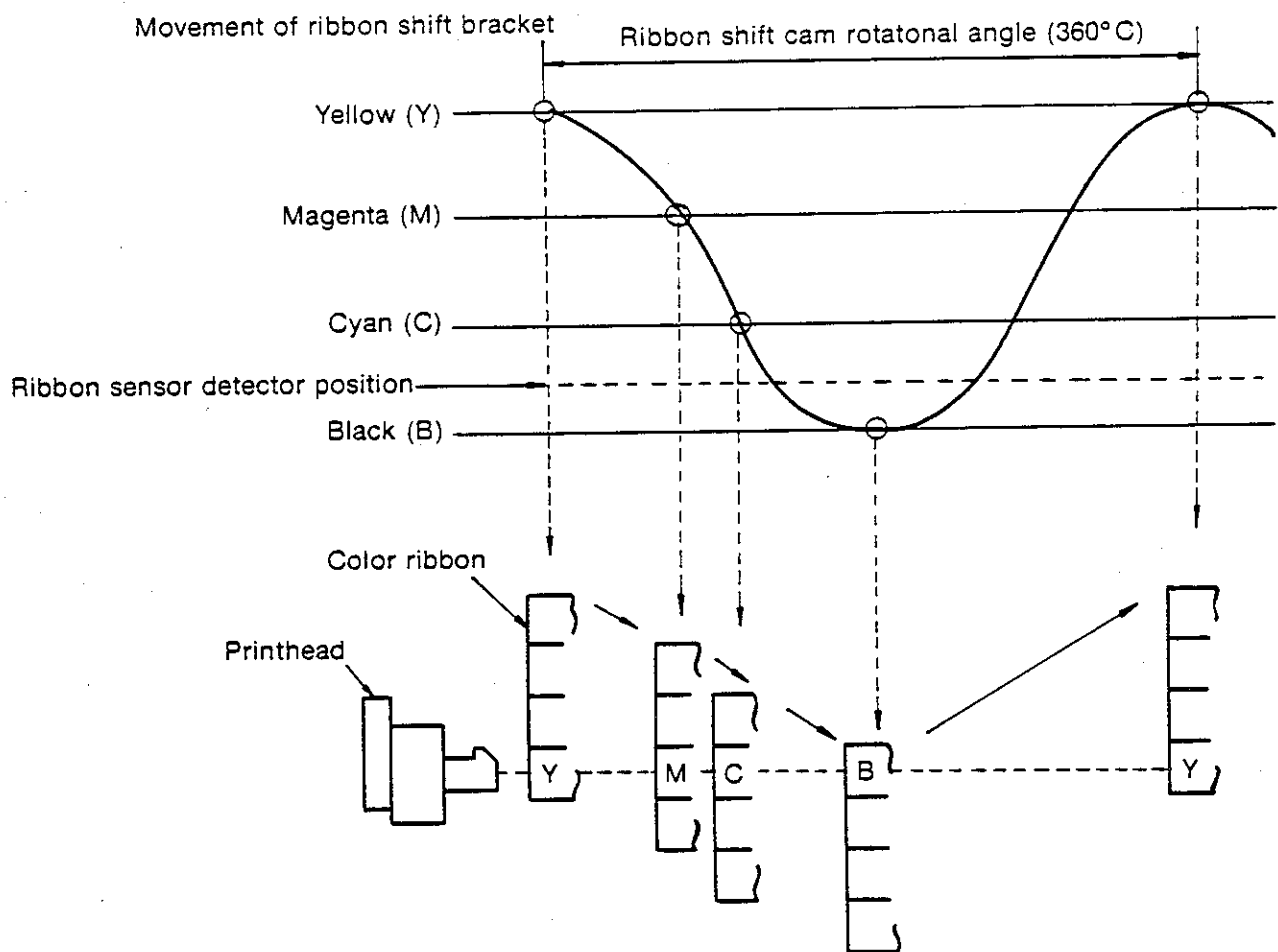


Figure A-7 Positions of printhead and color ribbon relative to the rotational angle of the ribbon shift cam

The ribbon drive assemblies (L) and (R) are coupled by a counter shaft as shown in Figure A-8, and the left and right ribbon shift brackets are moved up and down together.

The ribbon guide, on the other hand, is raised by spring action (see Figure A-8), and the roller installed in the ribbon guide meets the ribbon cartridge to determine the height of the ribbon guide. That is, if the ribbon cartridge moves up and down, the ribbon guide will also move up and down together to ensure a smooth ribbon change.

When the black ribbon is used, the ribbon shift cam is rotated slightly after each page feed (a fixed number of start pulses - 29 - is applied to the ribbon motor) resulting in the ribbon being moved up and down by small margins to ensure that the full width of the black ribbon is used for longer ribbon life.

(2) Ribbon drive mechanism

When the ribbon motor gear is rotated clockwise as indicated in Figure A-6, the planet gear engages gear D due to rotation of the ribbon motor, resulting in the ribbon drive shaft being rotated in the direction of the arrow via bevel gears A and B. The ribbon drive shaft engages a ribbon feed knob on the ribbon cartridge to ensure a smooth supply of ribbon.

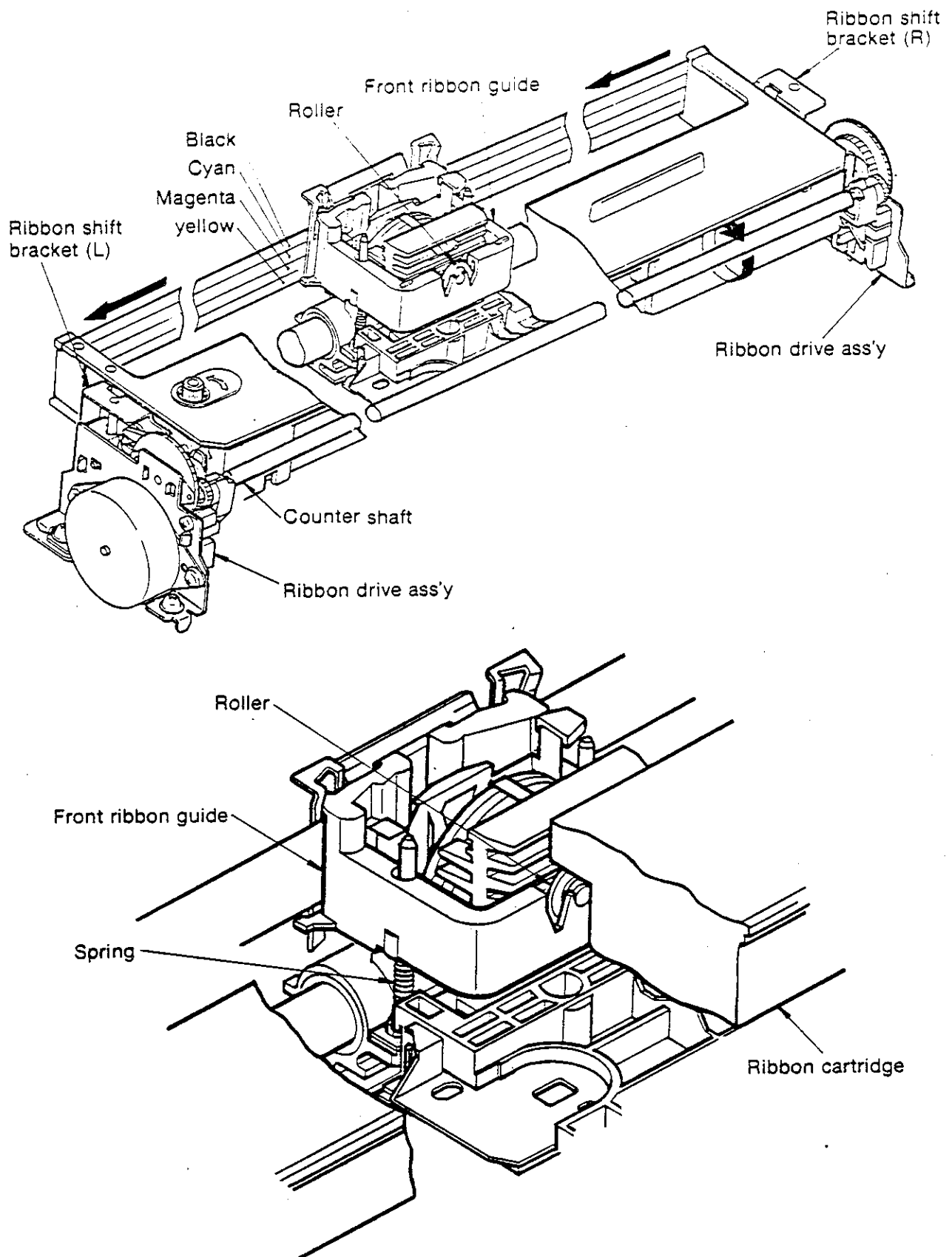


Figure A-8 Ribbon drive assembly and peripheral mechanisms

3.5 Paper Feed Mechanism and Operation

Line feed of the printing paper is achieved by an LF motor (Stepping motor) for driving purposes and platen / pin tractor feed.

(1) Paper feed operation (See Figure A-9)

The paper feed stepping motor is mounted on the left hand side frame, the motor driving power being transmitted to the platen via reduction gears. Platen rotation, in turn, is transmitted to the pin tractor by transmission gears.

The printer has been mechanically designed to feed 0.17 inches (4.23 mm) of printing paper for each revolution (48 steps in 360°) of the stepping motor.

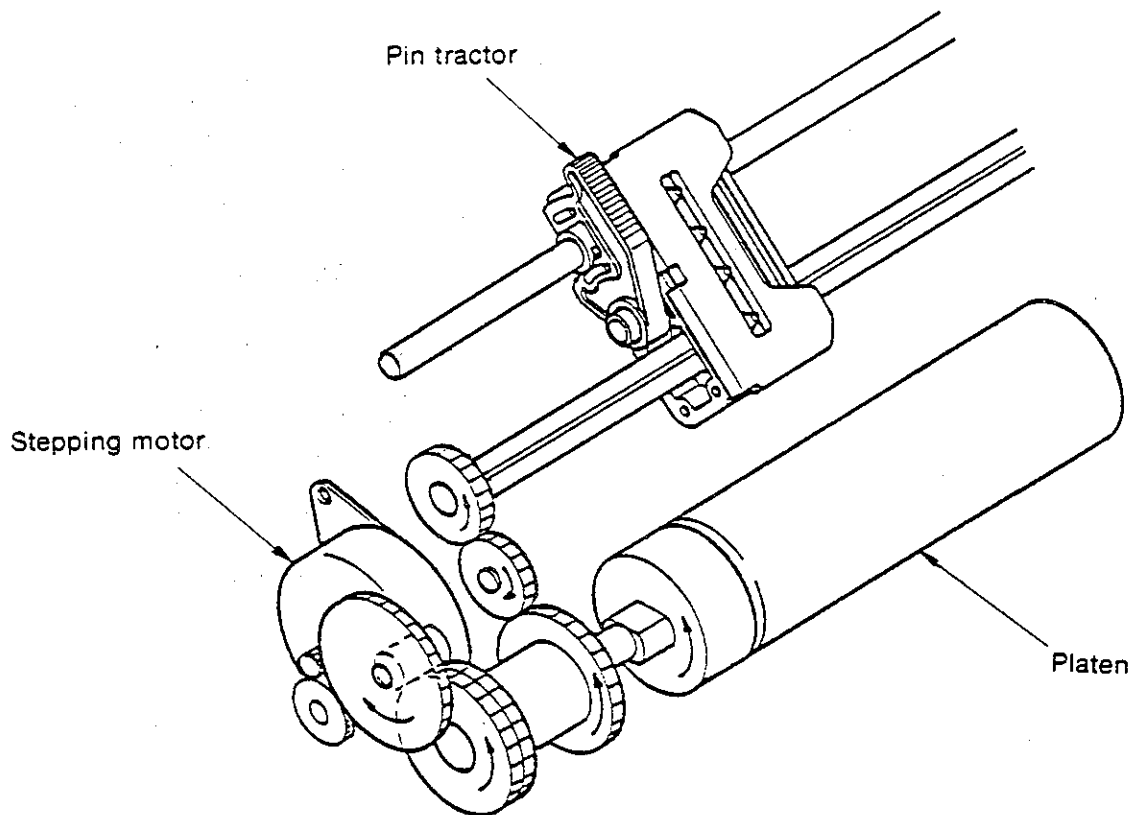


Figure A-9 Paper feed mechanism

(2) Paper clamping mechanism (See Figure A-10)

When the release lever is pulled forward (open position), the release link is moved back and the release link front and rear are rotated counter clockwise. The release shaft coupled to with these release links is also rotated counter clockwise, resulting in a gap being formed between the pressure roller and the platen to enable insertion of printing paper.

When the release lever is returned to the lock (or closed) position, the release link is moved forward, and the release link front and rear are rotated clockwise. The coupled release shaft is also rotated clockwise resulting in the pressure rollers pressing against the platen via the respective front and rear pressure levers to enable feeding of the printing paper.

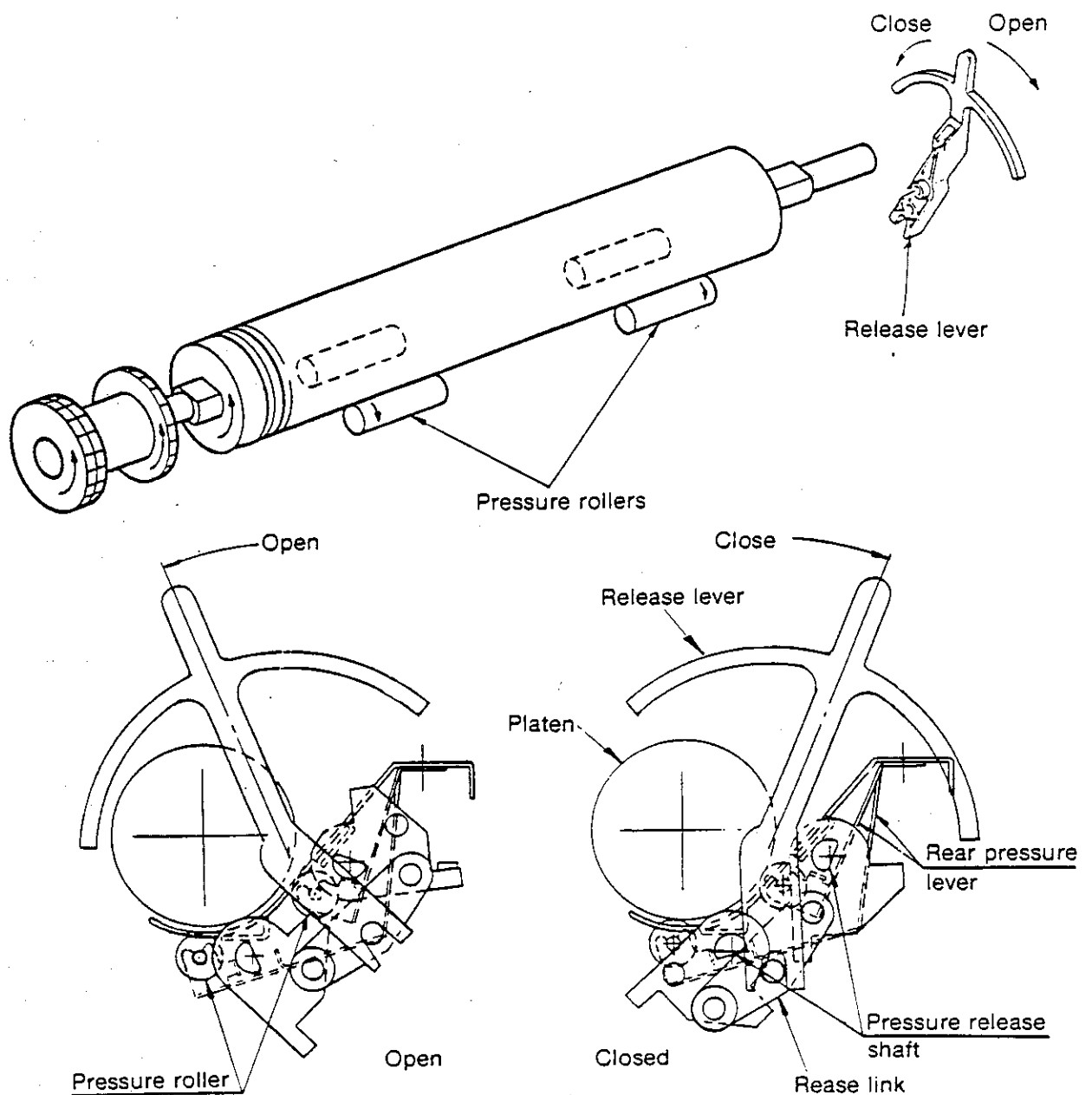


Figure A-10 Paper clamp mechanism

3.6 Paper-End Detector Mechanism

(1) Rear-paper-feed paper-end (See Figure A-11)

When printing paper has been set in the printer, the tip of the near-end lever is prevented from falling into the paper chute groove by the paper. The paper-end sensor is on at this stage. When the end of the paper is reached, the near-end lever falls into the paper chute groove, and the rear end of the near-end lever shuts off the sensor, therefore detecting the end of the paper. The paper end is detected when there is about 1 inch (25.4 mm) of paper remaining (before the printing position is reached).

(2) Bottom-paper-feed paper-end (See Figure A-11)

When printing paper has been set in the printer, the tip of the bottom-near-end lever is prevented from falling into the bottom paper guide hole by the paper. that is, the wedge shaped end of the bottom-near-end lever presses down against the projecting part of the near-end lever to keep the sensor on. When the end of the paper is reached, however, the tip of the bottom-near-end lever drops into the bottom-paper guide hole, and the rear end of the near-end lever shuts off the sensor, therefore detecting the end of the paper. The paper end is detected when there is about 1 inch (25.4 mm) of paper remaining (before the printing position is reached).

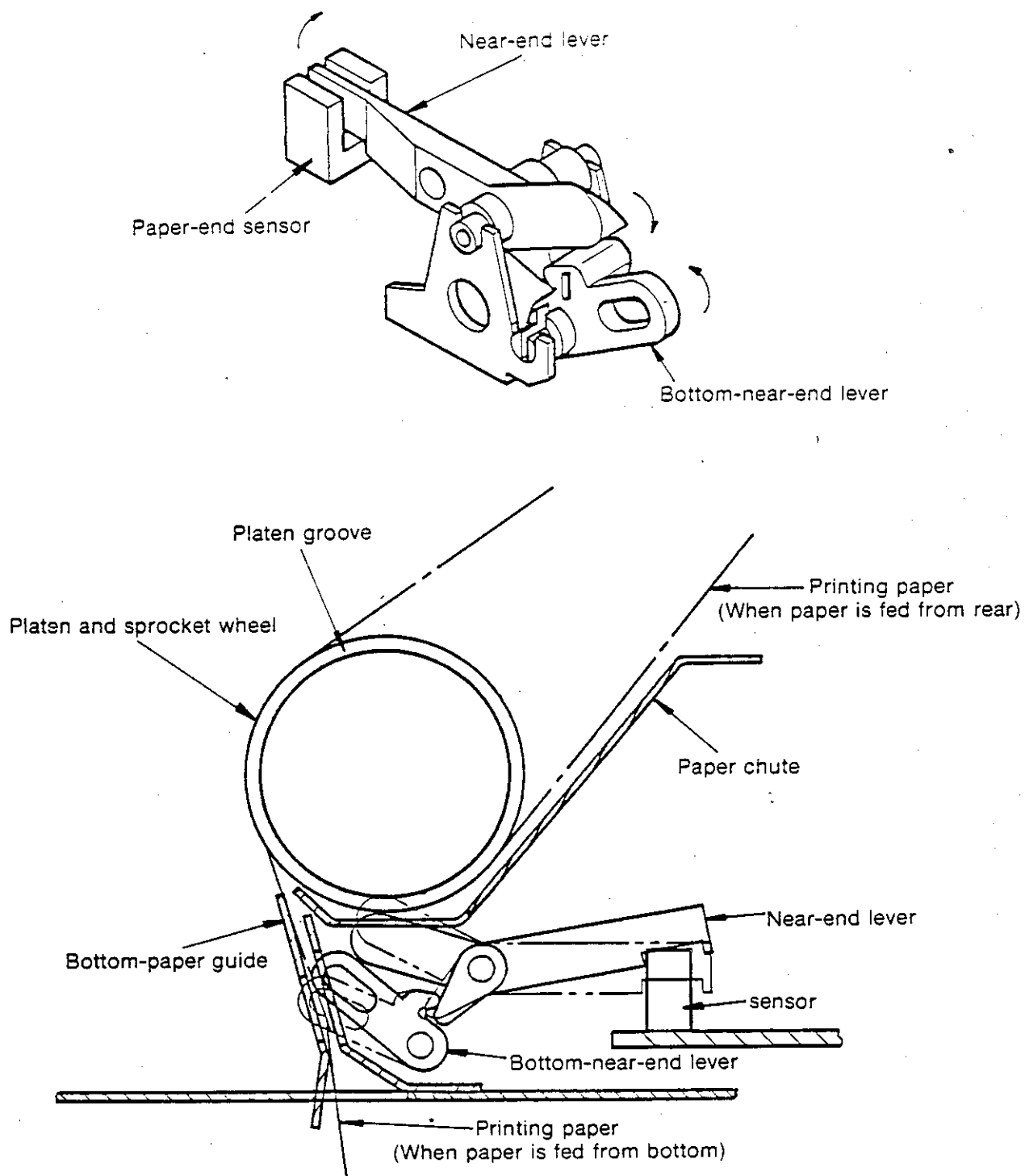


Figure A-11 Paper-end detector mechanism

App. II

LIST OF CHARACTER CODE

APPENDIX II. LIST OF CHARACTER CODE (ML COMPATIBLE)

Normal 7-bit code (selected by ESC-1:0 sequence)

		SI								SO							
		b7	b6	b5	0	1	0	1	0	1	0	1	0	1	0	1	0
		b7	b6	b5	0	1	0	1	0	1	0	1	0	1	0	1	0
b4b3b2b1	C	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
0 0 0 0	0			SP	③	④	P	⑪	p	p		a	▨	L	⌂	α	≡
0 0 0 0	0	0	16	32	48	64	80	96	112	0	16	32	48	64	80	96	112
0 0 0 1	1		DC1	!	1	A	Q	a	q		DC1	í	▨	⌂	⌂	β	±
0 0 0 1	1	1	17	33	49	65	81	97	113	1	17	33	49	65	81	97	113
0 0 1 0	2	STX	DC2	"	2	B	R	b	r	STX	DC2	ó	▨	⌂	⌂	Γ	≥
0 0 1 0	2	2	18	34	50	66	82	98	114	2	18	34	50	66	82	98	114
0 0 1 1	3	ETX	DC3	①	3	C	S	c	s	ETX	DC3	ú	⌂	⌂	⌂	π	≤
0 0 1 1	3	3	19	35	51	67	83	99	115	3	19	35	51	67	83	99	115
0 1 0 0	4		DC4	\$	4	D	T	d	t		DC4	ñ	⌂	⌂	⌂	Σ	∫
0 1 0 0	4	4	20	36	52	68	84	100	116	4	20	36	52	68	84	100	116
0 1 0 1	5			%	5	E	U	e	u			ñ	⌂	⌂	⌂	σ	J
0 1 0 1	5	5	21	37	53	69	85	101	117	5	21	37	53	69	85	101	117
0 1 1 0	6			②	6	F	V	f	v			a	⌂	⌂	⌂	μ	÷
0 1 1 0	6	6	22	38	54	70	86	102	118	6	22	38	54	70	86	102	118
0 1 1 1	7			'	7	G	W	g	w			o	⌂	⌂	⌂	τ	≈
0 1 1 1	7	7	23	39	55	71	87	103	119	7	23	39	55	71	87	103	119
1 0 0 0	8	BS	CAN	<	8	H	X	h	x	BS	CAN	¿	⌂	⌂	⌂	Φ	°
1 0 0 0	8	8	24	40	56	72	88	104	120	8	24	40	56	72	88	104	120
1 0 0 1	9	HT		)	9	I	Y	i	y	HT		~	⌂	⌂	⌂	θ	•
1 0 0 1	9	9	25	41	57	73	89	105	121	9	25	41	57	73	89	105	121
1 0 1 0	A	LF		*	:	J	Z	j	z	LF		~	⌂	⌂	⌂	Ω	•
1 0 1 0	A	10	26	42	58	74	90	106	122	10	26	42	58	74	90	106	122
1 0 1 1	B	VT	ESC	+	;	K	⑥	k	⑫	VT	ESC	¼	⌂	⌂	⌂	δ	✓
1 0 1 1	B	11	27	43	59	75	91	107	123	11	27	43	59	75	91	107	123
1 1 0 0	C	FF	FS	,	<	L	⑦	l	⑬	FF	FS	½	⌂	⌂	⌂	∞	n
1 1 0 0	C	12	28	44	60	76	92	108	124	12	28	44	60	76	92	108	124
1 1 0 1	D	CR	GS	-	=	M	⑧	m	⑭	CR	GS	¾	⌂	⌂	⌂	ø	z
1 1 0 1	D	13	29	45	61	77	93	109	125	13	29	45	61	77	93	109	125
1 1 1 0	E	SO	RS	.	>	N	⑨	n	⑮	SO	RS	«	⌂	⌂	⌂	€	■
1 1 1 0	E	14	30	46	62	78	94	110	126	14	30	46	62	78	94	110	126
1 1 1 1	F	SI	US	/	?	⑤	⑩	o	DEL	SI	US	»	⌂	⌂	⌂	∩	SP
1 1 1 1	F	15	31	47	63	79	95	111	127	15	31	47	63	79	95	111	127

Note: See the national language character set chart for characters identified by encircled numbers ① through ⑮.

Normal 8-bit code (selected by ESC!0 sequence)

b5	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
b6	0	0	1	1	0	0	1	1	0	0	1	0	1	0	1	1
b7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b4b3b2b1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	0		SP	③	④	P	⑪	p	p		á	⌘	L	⌘	α	≡
0 0 0 1	1		DC1	!	1	A	Q	a	q		í	⌘	⌘	⌘	⌘	±
0 0 1 0	2	STX	DC2	"	2	B	R	b	r	STX	ó	⌘	⌘	⌘	⌘	≥
0 0 1 1	3	ETX	DC3	①	3	C	S	c	s	ETX	ú	⌘	⌘	⌘	⌘	≤
0 1 0 0	4		DC4	\$	4	D	T	d	t		ñ	⌘	⌘	⌘	Σ	∫
0 1 0 1	5			%	5	E	U	e	u		ñ	⌘	⌘	⌘	σ	J
0 1 1 0	6			②	6	F	V	f	v		ä	⌘	⌘	⌘	μ	÷
0 1 1 1	7			'	7	G	W	g	w		ö	⌘	⌘	⌘	τ	≈
1 0 0 0	8	BS	CAN	(	8	H	X	h	x	BS	¿	⌘	⌘	⌘	Φ	°
1 0 0 1	9	HT		)	9	I	Y	i	y	HT	⌘	⌘	⌘	⌘	θ	•
1 0 1 0	A	LF		*	:	J	Z	j	z	LF	⌘	⌘	⌘	⌘	Ω	•
1 0 1 1	B	VT	ESC	+	;	K	⑥	k	⑫	VT	ESC	⌘	⌘	⌘	δ	✓
1 1 0 0	C	FF	FS	,	<	L	⑦	l	⑬	FF	FS	⌘	⌘	⌘	∞	n
1 1 0 1	D	CR	GS	-	=	M	⑧	m	⑭	CR	GS	⌘	⌘	⌘	ø	²
1 1 1 0	E	SO	RS	.	>	N	⑨	n	⑮	SO	RS	⌘	⌘	⌘	€	■
1 1 1 1	F		US	/	?	⑤	⑩	o		US	»	⌘	⌘	⌘	∩	SP

Note: See the national language character set chart for characters identified by encircled numbers ① through ⑮.

IBM 7-bit code (selected by ESC-I-2 sequence)

		SI								SO								
b7	b6	b5	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
b4b3b2b1	C	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	
0 0 0 0	0			SP	③	④	P	⑪	p	o			á	⌘	L	⌘	α	≡
		0	16	32	48	64	80	96	112	0	16	32	48	64	80	96	112	
0 0 0 1	1		DC1	!	1	A	Q	a	q		DC1	í	⌘	⌘	⌘	β	±	
		1	17	33	49	65	81	97	113	1	17	33	49	65	81	97	113	
0 0 1 0	2	STX	DC2	"	2	B	R	b	r	STX	DC2	ó	⌘	⌘	⌘	Γ	≥	
		2	18	34	50	66	82	98	114	2	18	34	50	66	82	98	114	
0 0 1 1	3	♥	DC3	①	3	C	S	c	s	♥	DC3	ú	⌘	⌘	⌘	π	≤	
		3	19	35	51	67	83	99	115	3	19	35	51	67	83	99	115	
0 1 0 0	4	♦	DC4	§	4	D	T	d	t	♦	DC4	ñ	⌘	⌘	⌘	Σ	∫	
		4	20	36	52	68	84	100	116	4	20	36	52	68	84	100	116	
0 1 0 1	5	♣	§	⌘	5	E	U	e	u	♣	§	ñ	⌘	⌘	⌘	σ	J	
		5	21	37	53	69	85	101	117	5	21	37	53	69	85	101	117	
0 1 1 0	6	♠		②	6	F	V	f	v	♠		ä	⌘	⌘	⌘	μ	÷	
		6	22	38	54	70	86	102	118	6	22	38	54	70	86	102	118	
0 1 1 1	7			'	7	G	W	g	w			o	⌘	⌘	⌘	τ	≈	
		7	23	39	55	71	87	103	119	7	23	39	55	71	87	103	119	
1 0 0 0	8	BS	CAN	(	8	H	X	h	x	BS	CAN	¿	⌘	⌘	⌘	Φ	°
		8	24	40	56	72	88	104	120	8	24	40	56	72	88	104	120	
1 0 0 1	9	HT		)	9	I	Y	i	y	HT		˘	⌘	⌘	⌘	θ	•
		9	25	41	57	73	89	105	121	9	25	41	57	73	89	105	121	
1 0 1 0	A	LF		*	:	J	Z	j	z	LF		˘	⌘	⌘	⌘	Ω	•	
		10	26	42	58	74	90	106	122	10	26	42	58	74	90	106	122	
1 0 1 1	B	VT	ESC	+	;	K	⑥	k	⑫	VT	ESC	½	⌘	⌘	⌘	δ	✓	
		11	27	43	59	75	91	107	123	11	27	43	59	75	91	107	123	
1 1 0 0	C	FF	FS	,	<	L	⑦	l	⑬	FF	FS	¾	⌘	⌘	⌘	∞	n	
		12	28	44	60	76	92	108	124	12	28	44	60	76	92	108	124	
1 1 0 1	D	CR	GS	-	=	M	⑧	m	⑭	CR	GS	i	⌘	⌘	⌘	ø	²	
		13	29	45	61	77	93	109	125	13	29	45	61	77	93	109	125	
1 1 1 0	E	SO	RS	.	>	N	⑨	n	⑮	SO	RS	«	⌘	⌘	⌘	€	■	
		14	30	46	62	78	94	110	126	14	30	46	62	78	94	110	126	
1 1 1 1	F	SI	US	/	?	⑤	⑩	o	DEL	SI	US	»	⌘	⌘	⌘	∩	SP	
		15	31	47	63	79	95	111	127	15	31	47	63	79	95	111	127	

Note: See the national language character set chart for characters identified by encircled numbers ① through ⑮.

IBM 8-bit code (selected by ESC-I-2 sequence)

b8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
b7	0	0	0	0	1	1	0	0	1	1	0	0	1	0	0	1	
b6	0	0	0	1	1	0	0	1	1	0	0	1	0	0	1	0	
b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	
b4b3b2b1	C	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	0			SP	③	④	P	⑪	p	ç	é	á	␣	␣	␣	␣	␣
		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
0 0 0 1	1		DC1	!	1	A	Q	a	q	ü	æ	í	␣	␣	␣	␣	␣
		1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
0 0 1 0	2	STX	DC2	"	2	B	R	b	r	é	Æ	ó	␣	␣	␣	␣	␣
		2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
0 0 1 1	3	♥	DC3	①	3	C	S	c	s	ä	ö	ú	␣	␣	␣	␣	␣
		3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
0 1 0 0	4	♦	DC4	\$	4	D	T	d	t	ä	ö	ñ	␣	␣	␣	␣	␣
		4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
0 1 0 1	5	♣	\$	%	5	E	U	e	u	à	ò	ñ	␣	␣	␣	␣	␣
		5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
0 1 1 0	6	♠		②	6	F	V	f	v	á	ú	æ	␣	␣	␣	␣	␣
		6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
0 1 1 1	7			'	7	G	W	g	w	ç	ù	ó	␣	␣	␣	␣	␣
		7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
1 0 0 0	8	BS	CAN	(	8	H	X	h	x	e	ÿ	¿	␣	␣	␣	␣	␣
		8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
1 0 0 1	9	HT		)	9	I	Y	i	y	ë	ø	ˆ	␣	␣	␣	␣	␣
		9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
1 0 1 0	A	LF		*	:	J	Z	j	z	è	ü	˘	␣	␣	␣	␣	␣
		10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
1 0 1 1	B	VT	ESC	+	;	K	⑥	k	⑫	ï	ç	¸	␣	␣	␣	␣	␣
		11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
1 1 0 0	C	FF	FS	,	<	L	⑦	l	⑬	í	É	¸	␣	␣	␣	␣	␣
		12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
1 1 0 1	D	CR	GS	-	=	M	⑧	m	⑭	ı	¥	ı	␣	␣	␣	␣	␣
		13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
1 1 1 0	E	SO	RS	.	>	N	⑨	n	⑮	À	Ê	«	␣	␣	␣	␣	␣
		14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
1 1 1 1	F		US	/	?	⑤	⑩	o	DEL	À	f	»	␣	␣	␣	␣	␣
		15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

Note: See the national language character set chart for characters identified by encircled numbers ① through ⑮.

National character set

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮
ASCII (0)	=	&	ø	œ	o	[		]	^	—	·	ı		ı	~
ASCII (0)	=	&	0	@	o	[		]	^	—	·	ı		ı	~
BRITISH	£	&	0	@	o	[		]	^	—	·	ı		ı	~
GERMAN	=	&	0	§	o	Ä	Ö	Ü	^	—	·	ä	ö	ü	ß
FRENCH	£	&	0	à	o	·	ç	§	^	—	·	é	ù	è	ê
SWEDISH	=	=	0	E	o	Ä	Ö	Å	Ü	—	é	ä	ö	å	ü
DANISH	=	&	0	@	o	Æ	o	Å	Ü	—	·	æ	ø	å	ü
NORWEGIAN	=	&	0	@	o	Æ	o	Å	^	—	·	æ	ø	å	~
DUTCH	£	&	0	@	o	[	ı	]	^	—	·	ı	ıj	ı	~
ITALIAN	£	&	0	§	o	·	ç	é	^	—	ù	à	ò	è	ı
TRS-80	=	&	ø	@	o	ı	ı	—	—	—	·	ı	ı	ı	—
SPANISH	ı	&	0	ı	o	Ñ	ñ	ı	ü	—	á	é	ı	ó	ú

LIST OF CHARACTER CODE (IBM COMPATIBLE)

Character set I (selected by ESC 7 sequence)

b8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b4b3b2b1	a	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	0			SP	①	②	P	③	p			á	▨	L	⊥	α	≡
		0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
0 0 0 1	1			!	1	A	Q	a	q			í	▨	⊥	⊥	β	±
		1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
0 0 1 0	2			DC2	"	2	B	R	b	r		DC2	ó	▨	⊥	π	≥
		2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
0 0 1 1	3			④	3	C	S	c	s			ú	|	⊥	⊥	π	≤
		3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
0 1 0 0	4			DC4	\$	4	D	T	d	t		DC4	ñ	⊥	⊥	Σ	∫
		4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
0 1 0 1	5			%	5	E	U	e	u			ñ	⊥	⊥	⊥	σ	∫
		5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
0 1 1 0	6			⑤	6	F	V	f	v			æ	⊥	⊥	⊥	μ	÷
		6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
0 1 1 1	7			'	7	G	W	g	w			ó	⊥	⊥	⊥	τ	≈
		7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
1 0 0 0	8			CAN	(	8	H	X	h	x		CAN	¿	⊥	⊥	⊥	°
		8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
1 0 0 1	9			HT	)	9	I	Y	i	y		HT	ˆ	⊥	⊥	⊥	•
		9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
1 0 1 0	A			LF	*	:	J	Z	j	z		LF	ˆ	⊥	⊥	⊥	•
		10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
1 0 1 1	B			VT	ESC	+	;	K	⑥	k	⑦	VT	ESC	½	⊥	⊥	√
		11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
1 1 0 0	C			FF	,	<	L	⑧	l	⑨		FF	½	⊥	⊥	⊥	n
		12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
1 1 0 1	D			CR	-	=	M	⑩	m	⑪		CR	i	⊥	⊥	⊥	²
		13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
1 1 1 0	E			SO	.	>	N	⑫	n	⑬		SO	«	⊥	⊥	⊥	•
		14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
1 1 1 1	F			SI	/	?	⑭	⑮	o			SI	»	⊥	⊥	⊥	SP
		15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

Note: See the national language character set chart for characters identified by encircled numbers ① through ⑮.

[illegible]

App 11-7

National character set

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮
ASCII (ø)	=	&	ø	@	O	[	^	]	^	—	.	|	|	|	~
ASCII (0)	=	&	0	@	O	[		]	^	—	.	|	|	|	~
BRITISH	£	&	0	@	O	[	^	]	^	—	.	|	|	|	~
GERMAN	=	&	0	§	O	Ä	Ö	Ü	^	—	.	ä	ö	ü	ß
FRENCH	£	&	0	à	O	.	ç	§	^	—	.	é	ù	è	ê
SWEDISH	=	&	0	É	O	Ä	Ö	Å	Ü	—	é	ä	ö	å	ü
DANISH	#	&	0	@	O	Æ	Ø	Å	Ü	—	.	æ	ø	å	ü
NORWEGIAN	#	&	0	@	O	Æ	Ø	Å	^	—	.	æ	ø	å	~
DUTCH	£	&	0	@	O	[	Ij	]	^	—	.	|	Ij	|	~
ITALIAN	£	&	0	§	O	.	ç	é	^	—	ù	à	ò	è	ì
FRENCH/CANADIAN	ü	ë	0	à	Ø	â	ç	ê	î	ï	ô	é	ù	è	û
SPANISH	!	&	0	í	O	Ñ	ñ	¿	ü	—	á	é	í	ó	ú

App. III

LIST OF MENU SETTING ITEM

APPENDIX III. LIST OF MENU SETTING ITEM (ML COMPATIBLE)

The table below lists the menu items for the Microline 294 printer unit with Microline compatible personality module.

Step	Menu item	Menu values	Description	Factory Setting
1	PRNT MODE	UTILITY NLQ	Print Mode Utility Mode (Data Processing Mode) Near Letter Quality mode (NLQ Mode)	UTILITY
2	CPI	10, 12, 17	Characters Per Inch	10
3	NO. OF COPIES	1 & 2, 3 & 4	Slow Down for Multi-part Paper	1 & 2
4	LPI	6, 8	Lines Per Inch	6
5	EMPHSZD	Y, N	Emphasized	N
6	ENHNCD	Y, N	Enhanced	N
7	DBL WDT	Y, N	Double Width	N
8	DBL HGHT	Y, N	Double Height	N
9	SUP/SUB	SHRINK, NORM	Superscript Subscript Printing	SHRINK
10	ITALICS	Y, N	Slant Printing	N
11	CHR SET	NORM, DLL, IBM	CHARACTER SET NORM: Normal Character Set DLL: DLL Character Set IBM: IBM Character Set	NORM
12	PROP SPC	Y, N	Proportional Spacing	N
13	LANG SET	0, 0, BR, GR, FR, SW, DA, NO, DU, IT, TRS-80, SP	Language 0: ASCII (0) 0: ASCII (0) BR: British GR: German FR: French SW: Swedish DA: Danish NO: Norwegian DU: Dutch IT: Italian SP: Spanish TRS-80	0
14	7/8 BIT FMT	7, 8	7 or 8 bit Data Format	8
15	GRAPHICS 7/8 BIT	7, 8	7 or 8 bit Data Format in Graphics	7
16	GRAPHICS UNIDR	Y, N	Unidirectional Printing in Bit Image Graphics Mode	N
17	PG LGTH	3, 3.5, 4, 5.5, 6, 7, 8, 8.5, 11, 11-2/3, 12, 14	Page Length (inch)	12
18	COLOR	BLK, YLW, RED, BLU VLT, ORG, GRN, BLK RBN	Printing Color	BLK RBN
19	SEL DLL CHR SET #	0, 1, 2, 3	Select DLL Character Set Number	0
20	PRNT DEL CODE	Y, N	Print DEL Code	Y
21	DC 1/3 EFF	Y, N	DC1, DC3 Protocol Effective	Y
22	SKIP OVER PERF	Y, N	Skip Over Perforation	N
23	AUTO LF	Y, N	Automatic Line Feed with CR Code	N
24	PPR OUT OVRD	Y, N	Paper Out Override	N

No	Menu item	Menu values	Description	Factory Setting
25	PRINT REG	-5, -4, -3, -2, -1 0, -1, -2, -3, -4, -5	Print Registration	0
26	PARITY	ODD, EVEN, NONE	Parity Bit	NONE
27	DATA BITS 7-8	7, 8		8
28	PRCTL	RDY BSY X-ON OFF	Protocol Ready Busy X-on X-off	RDY BSY
29	DIAG TEST	Y, N	Diagnostic Test	N
30	BUSY LINE	SSD-, SSD- DTR, RTS	Busy Line	SSD-
31	BAUD RATE	19.2, 9.6, 4.8, 2.4, 1.2, .6, .3	Baud Rate (Kilo BPS)	9.6
32	DSR SGNL	VALID, INVALID	DSR Signal	VALID
33	DTR SGNL	(RDY ON SLCT, RDY ON PWR UP)		RDY ON PWR UP
34	BUSY TIME	.2, 1	Busy Time (sec)	.2

Comment:

1. Item # 25-33 are for RS232C serial interface only.

EXAMPLE Setting 12 CPI

	STEP	PRINT OUT	COMMENT
(1)	Printout	UTILITY	Utility mode Current Setting
(2)	Push SEL	NLQ	New value select
(3)	Set NLQ and go to CPI set by pushing FF button	CPI 10	10 CPI current setting
(4)	Exit menu by pushing TOF	Menu End	

NOTE: 1) All printout is in default mode (10 CPI, 6 LPI, Utility character font).

- 2) If conflicting functions are set in the menu mode, the printer will treat these function codes as if received in the following sequence:

PRINT MODE
CPI

PRINT REG

The latest command received will take precedence in the event of conflict.

- 3) TOF will not be reset upon existing menu mode by pushing TOF button.

LIST OF MENU SETTING ITEM (IBM COMPATIBLE)

The table below lists the menu items for the Microline 294 printer unit with IBM compatible personality module.

Step	Menu item	Menu values	Description	Factory Setting
1	PRNT MODE	UTILITY	Print Mode	UTILITY
		UTILITY	Utility Mode	
			(Data Processing Mode)	
		NLQ	Near Letter Quality Mode	
			(NLQ Mode)	
2	CPI	10, 12, 17, 1	Characters Per Inch	10
3	NO. OF COPIES	1 & 2, 3 & 4	Slow Down for Multi-part Paper	1 & 2
4	LPI	6, 8	Lines Per Inch	6
5	EMPHSZD	Y, N	Emphasized	N
6	ENHNCD	Y, N	Enhanced	N
7	DBL WDTN	Y, N	Double Width	N
8	DBL HGHT	Y, N	Double Height	N
9	SUP/SUB	SHRNK, NORM	Superscript Subscript Printing	SHRNK
10	ITALICS	Y, N	Slant Printing	N
11	CHR SET	SET I	CHARACTER SET	SET II
		SET II	SET I: IBM Character Set I	
		DLL	SET II: IBM Character Set II	
			DLL: DLL Character Set	
12	PROP SPC	Y, N	Proportional Spacing	N
13	LANG SET		Language	0
			0: ASCII (0)	
			BR: British	
			GR: German	
			FR: French	
			SW: Swedish	
			DA: Danish	
			NO: Norwegian	
			DU: Dutch	
			IT: Italian	
			SP: Spanish	
			FR/CA: French Canadian	
14	GRAPHICS UNIDR	Y, N	Unidirectional	N
			Printing in Bit Image	
			Graphics Mode	
15	PG LGTH	3, 3.5, 4, 5, 5.6, 7, 8, 8.5, 11, 11-2/3, 12, 14	Page Length (inch)	12
16	COLOR	BLK, YLW, RED, BLU, VLT, ORG, GRN, BLK RBN	Printing Color	BLK RBN
17	SEL DLL CHR SET#	0, 1, 2, 3	Select DLL Character	0
18	SKIP OVER PERF	Y, N	Skip Over Perforation	N
19	AUTO LF	Y, N	Automatic Line Feed with CR Code	N
20	PPR OUT OVRD	Y, N	Paper Out Override	N
21	PRINT REG	+5, +4, +3, +2, +1, 0, -1, -2, -3, -4, -5	Print Registration	0
22	PARITY	ODD, EVEN, NONE	Parity Bit	NONE
23	DATA BITS 7/8	7, 8		8
24	PRCTL	RDY/BSY	Protocol	RDY/BSY
		X-ON/OFF	Ready/Busy	
			X-on/X-off	
25	DIAG TEST	Y, N	Diagnostic Test	N
26	BUSY LINE	SSD-, SSD+, DTR, RTS	Busy Line	SSD-

Step	Menu Item	Menu values	Description	Factory Setting
27	BAUD RATE	19.2K 9.6K 4.8 2.4 1.2K 6.3	Baud Rate Kilo BPS	9.6
28	DSR SGNL	VALID, INVALID	DSR Signal	VALID
29	DTR SGNL	RDY ON SLCOT RDY ON PWR UP		RDY ON PWR UP
30	BUSY TIME	.2, 1	Busy Time (sec.)	.2
31	OWS	Y, N	0 with slasn	N

Note 1: If the menu is selected the user must re-adjust the TOF after the menu is printed. Otherwise a form feed will cause the TOF to be located at the end of the menu.

Note 2: Items #21-29 apply to serial interface only.

EXAMPLE Setting 12 CPI

	STEP	PRINT OUT	COMMENT
(1)	Printout	UTILITY	UTILITY curent setting
(2)	Push SEL	NLQ	New value select
(3)	Set NLQ and go to CPI set by pushing FF button	CPI 10	10 current setting
(4)	Exit menu by pushing TOF	Menu End	

NOTE: 1) All printout is in default mode (10 CPI, 6 LPI, Utility character font).

2) If conflicting functions are set in the menu mode, the printer will treat these function codes as if received in the following sequence:

PRINT MODE
CPI

PRINT REG

The latest command received will take precedence in the event of conflict.

3) TOF will not be reset upon existing menu mode by pushing TOF button.

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